

®

NetComm

# ***The SmartModem™ Family***

*Incorporating:*

*21/23A, SA. 1200A, SA. 2400A, SA.*

*123A, SA. 1234A, SA.*

*Intelligent RS232 Direct Connect Modems.*

***User & Reference Manual***

***ISSUE 3***

*December 1987*

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# ***NetComm<sup>®</sup> (Australia) Pty. Limited***

**Intelligent Auto Dial & Answer  
RS232 Direct Connect Modems**

## **The SmartModem<sup>™</sup> Family**

SmartModem 21/23 A, SA  
SmartModem 1200 A, SA  
SmartModem 2400 A, SA  
SmartModem 123 A, SA  
SmartModem 1234 A, SA

### **User & Reference Manual**

Issue 3 December 1987

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PRODUCT *SmartModem Family*

MODEL (specify) SERIAL NO:

NAME

TITLE

COMPANY

ADDRESS

POST CODE STATE

COUNTRY TELE:

TLX/EMAIL/MINERVA/SOURCE OTHER (specify)

SIGNED DATE

PURCHASED FROM

ADDRESS

DATE OF PURCHASE

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Version 2.1 03/1987

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***Read This First***

***Read This First***



## ***Read This First***

Congratulations on your purchase of a NetComm SmartModem. You will find your SmartModem will open the door to a whole new world of communications to you.

In this manual you will learn how to install and use the NetComm SmartModem on the personal computer of your choice. Together with a communications software package, the SmartModem lets you communicate with nearly any other micro, mini, and mainframe computer. Also, the SmartModem can be connected to printers, VDU's and mainframe hosts and let them use its many automatic features.

### **What You Need to Know to Use This Manual**

---

To use this manual, you should know how to use the keyboard and screen of the personal computer or terminal to which you will connect the SmartModem. If you do not know how to use the PC, read the manual that is appropriate to the device you're using.

### **What This Manual Tells You**

---

This manual is divided into seven units:

Chapter 1 "What the SmartModem Family Does"; tells you what the SmartModem does and what hardware and software you need to use it.

Chapter 2 "Installing and Testing the SmartModem"; tells you step-by-step how to unpack, install, and set-up the SmartModem.

Chapter 3 "Using the SmartModem"; describes the ideas and concepts behind the design of the SmartModem.

Chapter 4 "SmartModem Commands"; tells you how to use and control the SmartModem for asynchronous operation.

Chapter 5 "Synchronous Operation"; indicates the commands and switches that are used to control the SmartModem in synchronous mode.

Chapter 6 "Diagnostic and Test Facilities"; helps you to isolate problems with your communications link.

Appendices "Data Communications for Beginners"; provides further information on using data communications. Also included are technical specifications, cable specifications and hints on resolving communications link problems.

There is also a glossary at the end of the manual for terms that may be new to you.

## **What The Symbols Mean**

---

Throughout this manual, some terms may be used with which you are not familiar. These words are defined in the glossary.

Helpful hints and interesting sidelights appear in boxes, like this:

.....  
*NOTE: You may want to read this note, but then again you may not.*  
.....

Warnings about potential problems and advice about how to avoid them appear in boxes like this:

-----  
**WARNING: Pay attention to what's in these boxes -- or else.**  
-----

You'll also find notes in the margin that emphasize a point or refer to related information in another part of the manual.

Read the marginal notes for quick reference

## **Repair and Replacement**

---

On the reverse of the second sheet of this manual are your Hardware & Software Warranties. Read them carefully. Basically they say this: If within 12 months of purchase, your hardware fails to function properly through some error on our part, we will repair or replace it at our option. If your software product fails and the failure is in the medium (eg: your diskette or EPROM), the above hardware warranty applies. If your software product fails by reason of faulty copying, we will replace the program on your medium. Faulty product should be returned to us postpaid and properly packed (see below) along with the following:

- 1 Proof of purchase and/or license plus supply date.
- 2 A description of the problem (and whose fault you think it is).
- 3 Where a diskette fails to function properly, a description of the system on which the program is being used (amount of memory, peripherals attached, cards installed, etc).
- 4 Your Warranty Card (if you haven't already sent it in).

This warranty applies only to the original user, and does not apply to any product which has been used prior to its supply by any dealer or distributor.

In the event that we receive no Warranty Registration card, no warranty service will be provided.

After the 12 month period under the Hardware Warranty (in the event that the failure is not our fault) the hardware will be repaired or replaced, at NetComm's option, and the entire cost including shipment shall be to your account. A faulty diskette will be replaced (if returned post paid) for a charge of \$25.00. Enclose \$25.00 with your disk to avoid COD and shipping charges.

### Shipping Diskettes and Eproms

When mailing a diskette or EPROM, do not just put it in a plain envelope. Not even a padded envelope. The post has an awful tendency to bend and break things. You should sandwich the diskette between two pieces of corrugated cardboard and then put it in an envelope. Write the words "DO NOT BEND" on both sides of the envelope in a colour which stands out. Alternatively, you may purchase special diskette mailers from your local PC dealer. You should box your EPROM between two sheets of foam rubber and write the word "FRAGILE" on the box.

NETCOMM strongly advises in order to avoid damage to your modem, which may in turn void your Hardware warranty, that updates to the SmartModem Program are carried out by NetComm engineers redubbing the EPROM on your behalf. Please return the entire modem, correctly packaged to NetComm.

### Software Updates

Fill out and mail in the Warranty Registration card supplied with this product.

If it becomes necessary for NetComm to provide a corrected version of your SmartModem Program or software, you will receive a letter describing the errors that are being fixed and any new features which you may get as a side effect. You may then send in your diskette, modem or EPROM and the new program will be returned to you.

This card will also put you on our mailing list for new products and upgrades to the product.

### **Comments and Suggestions**

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If you have any suggestions for changes or improvements in the current product, or suggestions for a new product, just drop us a line. Your comments are always welcome.

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# ***What the SmartModem Does***

# ***What the SmartModem Does***

# Chapter 1

## WHAT THE SMARTMODEM DOES

In this chapter you will learn what the SmartModem Family does and what you will need to use it.

### Communicate with Many Computers

---

The SmartModem lets your personal computer or terminal -- that is, any PC with a normal serial port or any simple interactive terminal -- communicate with almost any other computer. It is also ideal for host computers and Bulletin Board services.

A "serial port" normally has a 25 pin connector and conforms to the "RS232" (or "V24") electrical definition. The serial port on the IBM AT uses a 9 pin connector. The serial port on the Apple Mac uses a "mini DIN" connector.

This means that you get the use of several computers for the price of one. The SmartModem provides to one PC, the ability to connect to other PC's, various mainframe and mini computers, Data bases, Information Services, Electronic Mail services and lots more.

### INTELLIGENT MODEM

Your SmartModem is an intelligent modem, which means that it can both dial and answer your telephone. What makes your modem intelligent is its built-in microprocessor which lets it implement all of the communications between your computer or terminal and the computer that you are calling, with a minimum amount of effort from you.

### 'AT' COMMAND COMPATIBLE

The SmartModem Family is particularly designed to be used with the enormous range of communications packages which use a standard RS232 Serial Port and in particular, the 'AT' industry standard command set (pioneered by Hayes Microcomputer Products in USA) to control the modem.

Naturally, you can easily use packages which are not designed for the 'AT' commands; you can send the required commands directly to the modem.

### ASYNCHRONOUS AND SYNCHRONOUS

The SmartModem family operate synchronously and asynchronously.

.....  
*Note: Some models have an 'SA' suffix; they have switches on the front panel.*  
.....

In asynchronous operation the modem can automatically dial and connect out to Bulletin Board Systems, Electronic Mail, High Speed Telex, Videotex and other computers which use asynchronous communications, at speeds from 300 to 2400 bps.

The SmartModem family (except 21/23) allow connection of synchronous terminals to remote mainframe hosts (which are also operating synchronously). You can therefore dial and connect, in synchronous mode, from polled terminals.

The 'SA' models allow manual operation via front panel switches.

## **MULTIFUNCTIONAL**

The SmartModem removes the need to have different modems to communicate with different types of computers.

This manual describes the whole SmartModem Family, which consists of ten members. The suffix on the model number indicates the facilities it supports. The list below describes the differences between the models:

### **Meet the SmartModem Family**

---

The CCITT is a committee that defines standards used by Australian Telecom. 'Bell' are standards used in the USA.

SmartModem 21/23A&SA	-	CCITT V21, V23, Bell 103
	-	Synchronous <sup>1</sup> and Asynchronous
	-	"AT" command compatible (in asynchronous mode)
		300/300, 1200 bps Half Duplex <sup>1</sup> and 1200/75 bps full Duplex operation
SmartModem 1200A&SA 2400A&SA	-	CCITT V22, V22 bis <sup>2</sup>
	-	Bell 103, 212 and 2400 <sup>2</sup>
	-	Synchronous and Asynchronous
	-	"AT" command compatible (in asynchronous mode)
	-	300/300, 1200/1200 bps Full Duplex and 2400/2400 bps Full Duplex operation
SmartModem 123A&SA 1234A&SA	-	CCITT V21, V22, V22 bis <sup>2</sup> , V23
	-	Bell 103, 212 & Bell 2400 <sup>2</sup>
	-	Synchronous and Asynchronous
	-	"AT" command compatible (in asynchronous mode)
	-	300/300, 1200/1200, bps Full Duplex, 1200 bps Half Duplex <sup>1</sup> , 1200/75 and 2400/2400 bps Full Duplex operation

(<sup>1</sup>Synchronous in "SA" models only; <sup>2</sup>2400 FDX only in 2400 and 1234 models)



All of these models offer the same basic facilities with each model supporting different combination of modulation speeds and types. This manual explains the differences that apply.

-----  
**WARNING:** This Manual refers to SmartModem models released after May 1986 or which return a version number larger than 800 from an ATI command in Verbal response mode. If you are not sure as to the applicability of the manual please check with your Dealer or NetComm.  
-----

## **Keeping You Informed**

---

The SmartModem will, after connecting to a remote modem, respond with a CONNECT message that tells you the speed of the connection. This lets you change your terminal speed to match the modem and the originating terminal. Some up-to-date data communications programs will automatically select the same speed that the modem has found for connection. Read Chapter 4 about the 'Response Codes' and especially the extended Response Code set (the "ATX1" command). The modems use an internal speaker plus eight lights to further let you know what is going on.

## **Important Features**

---

### **MODEM AND TELEPHONE**

The SmartModem is the link between your computer or terminal and the telephone socket. It replaces your telephone. You can still have a telephone, of course; one can be attached to the back of the modem.

From here we will refer to the "SmartModem". All features generally apply to all models. Where this is not the case the manual will tell you.

### **AUTO DIAL. AUTO ANSWER**

The SmartModem takes care of the dialling, answering and disconnection of the phone line for you, especially if your communications program already has the ability to do this built-in.

Portability and versatility are key features of the SmartModem Family. It is designed for Australian Telecom connection but it can communicate using US Bell standards. Those of you who travel a lot or dial around the world to communicate can go most places with the SmartModem.

### **SELECTING SPEEDS. DATA FORMAT. ETC.**

The SmartModem is intelligent and does not need you to specify the speed of the data coming from the computer or terminal. Nor do you need to specify the character format (no. of bits, start bits, stop bits, parity).

All these are established automatically by the SmartModem.

To select 300 bps, set your PC up for that speed; to select 1200 set your PC up for 1200 bps.

## SAVEABLE OPTIONS

The SmartModem has also been designed to remove the frustration of configuring it to your particular requirements each time you use it.

There are many options which have been set to sensible values in the factory. If you need to update these then you need only issue a command from your terminal. This avoids the requirement to become familiar with a myriad of minute DIP switches or "jumpers" located on a printed circuit board. These commands are issued in Asynchronous mode to the SmartModem.

Once your SmartModem has been configured to your requirements, the "&W" command will store your selections so that when you next turn the modem on it will automatically be set the way you require it. Your configuration is stored in the SmartModem in an area known as the "non-volatile RAM" (Random Access Memory). This non-volatile RAM will store details even after the modem power is turned OFF.

## OUTSTANDING PERFORMANCE & THROUGHPUT

The SmartModem uses the most recently developed modem technology available. There are three main features that ensure the best possible performance. Some of these only apply to the high speed modes:

### Automatic Adaptive & Fixed Compromise Equalisation

The SmartModem continuously monitors the characteristics of each individual connection and adjusts its performance accordingly. This minimises the effect of long distance connections or poor quality phone lines.

### Digital Signal Processing (1200, 2400, 123, 1234 only)

The SmartModem uses high speed Digital Signal processors to control the modulation and demodulation. Also, the modem uses an "Integrated Analog" IC. This avoids the re-adjustments needed in older style modems due to age and temperature. The DSP/IA combination provides the flexibility and accuracy provided and ensures the modems' remarkably low incidence of errors ("Bit Error Rate" = "BER") exhibited, even over poor lines.

### Local & Remote Error Testing

The SmartModem is capable of different self tests, which can be operated remotely and independently of the attached terminal, host or PC. If you are concerned about performance these tests will assist you to isolate the problem area.

### Speed Rate Converter: Buffered

This applies to the 21/23, 123 and 1234 SmartModems. If you select V23 1200 bps the SmartModem adopts 1200/75 bps, i.e. 1200 outbound (to you from the host) and 75 inbound. Now, if your computer or terminal is then configured at 1200/1200, the SmartModem automatically converts your inbound PC data from 1200 bps to 75 bps (about as fast as you type) and buffers your data up to about 50 characters.

## Dumb Mode Operation

The SmartModem can be used in mainframe connections where no modem intelligence is required. This facility is called "Dumb Mode".

In this mode the SmartModem can be configured to give no response to traffic (commands or data) from the local DTE (terminal or mainframe/mini). To all intents and purposes it is like conventional manual (dumb) modems.

The modem displays its responses to the local DTE by raising and lowering the various RS232 signals such as DSR, CD, RING etc.

In Dumb Mode the "SA" SmartModems always respond to the front panel switch settings when establishing the connection.

## Telecom Approved

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The modems are fully approved by Telecom Australia. Authorisation Number C85/37/1310 (Telecom Australia).

## What You Need

---

Here's what you need to use a SmartModem:

- \* a PC system with preferably at least one disk drive, and a suitable video display device, OR a Terminal or Host Computer. This must have at least one RS232 serial port.
- \* an RS232 cable with a male DB25 at the modem end and a suitable connector for the PC's (Terminals) RS232 connector.
- \* a normal Telecom voice grade telephone line, preferably not via a switchboard or PABX etc. Read Appendix F.

Some old and very new switchboards may cause minor troubles. Check with your dealer or Telecom if you are unsure

- \* suitable communications software package for your computer or terminal.

If you want to print any data that you have received, you will need a printer. Check which models and interfaces are supported by your communications software package(s).

## **Important Telecom Information**

---

Telecom require you are aware of the following:-

### **Telecom Advice Regarding Location and Connection of Modems In Dangerous Situations**

"The apparatus described in this Authorisation can only be located and connected to Telecom plant in normal commercial and domestic situations. Where location and connection is required in a dangerous situation (eg. High voltage power station) and the electrical safety protection limits of line isolation may be exceeded, separate approval must be sought from Telecom in each instance.

### **Telecom Compliance Regarding Repetitive Calling Facilities**

Telecom requires customers who have equipment which has repertory dialing facilities to be aware of their requirements when using this equipment. The following section is a reprint from Telecom Specification 1056, Issue 3.

#### **"Definition**

Repertory Dialler - A storage device which allows a telephone customer to store one or more telephone addresses (telephone numbers), and at any subsequent time to manually select a stored address (or addresses) which will then be automatically transmitted to the exchange line to originate calls on the Switched Telephone Network.

Repetitive calling facilities shall comply with the following:

- (i) The facilities shall be manually initiated, and provision shall be made for the facility, once actuated, to be cancelled before the sequence of calls has been completed.
- (ii) the maximum number of calls in any automatic redialling sequence or sequential calling sequence where no manual action is required between calls shall be as follows.
  - (a) Repertory diallers which do not incorporate service tone detectors - Three calls (the original plus two automatically initiated retries).
  - (b) Repertory diallers which incorporate service tone detectors which will ensure that the line will be released after the receipt or otherwise of a service tone indicating the call will not be successful - Five calls (the original plus four automatically initiated retries).
- (iii) At the end of any unsuccessful call, there shall be an "Off Line" period of  $60 \pm 10$  seconds before the line is automatically looped to initiate another call to the same number.
- (iv) There shall be an "Off Line" period of at least 2 seconds between two calls addressed to different numbers.

- (v) An automatic redialling sequence in progress shall be automatically cancelled by:-
  - (a) A successful call (indicated by an answer from a called party) made from a repertory dialler which incorporates service tone detectors, or
  - (b) Any manual action of the caller which could cause a sequence in progress to be interrupted, e.g. using the associated telephone for normal call ar to take control of a call established from the repertory dialler.
- (vi) It shall be possible for the caller to use the repertory dialler to make single calls to any number stored in it without automatically actuating any repetitive calling facilities with which the number called is associated."



# ***Installing & Testing the SmartModem***

# ***Installing & Testing the SmartModem***



# Chapter 2

## INSTALLING AND TESTING THE SMARTMODEM

### Unpacking the Modem

---

As you unpack your SmartModem package, check to make sure it contains these items:

- the NetComm SmartModem;
- this User & Reference manual;
- the telephone connection cable;
- the wall/floor mounted plug pack power supply;
- a form supplied by Telecom Australia - "Application for Connection or Attachment of Apparatus to the Telephone System", also known as the "TS72" form;
- Some models are supplied with a hand held push button phone.

If any items are missing, contact the dealer or sales representative from whom you purchased the SmartModem.

### THE FRONT PANEL

Figure 2-1 shows a front view of a SmartModem with a telephone on top of it - notice the indicator lights on the front of your modem. They let you know what the SmartModem is doing. There is also a speaker inside which also keeps you informed.

.....  
*NOTE: Before you try to connect your modem or turn it on, take a minute to look over it and become familiar with it.*  
.....

### DIFFERENT MODELS

As mentioned above there are different models in this family. Generally all models have a similar front and back panel.

Only the Synchronous models, those with the "SA" suffix, have a number of configuration switches on the front panel. These are described in detail in Chapter 5 below.

The operation and control of the modem is generally the same - the only exceptions are where certain commands and features are oriented to one particular model. Where commands and features are specific, this manual will tell you.

*NOTE: If your model has switches on the front panel, you will need to read Chapter 5.*

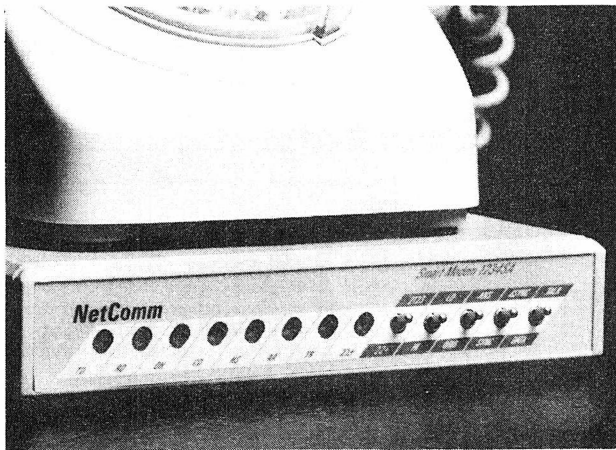


Figure 2-1. Front View of SmartModem ("SA" model).

### WHAT THE LIGHTS MEAN

As you can see, there are eight (8) indicator lights on the front of your SmartModem. They indicate the state of the Modem, and they mean the following:

- TD Transmit Data:**  
The modem is transmitting data. This indicator flashes as data is sent.
- RD Receive Data:**  
The modem is receiving data. Each flash of the indicator represents data being received.
- OH Off Hook:**  
When on, the modem has 'lifted up the handset' and is using the phone connection. Don't try to use the handset at the same time - you will corrupt the data.
- CD Carrier Detect:**  
The modem has recognised a carrier signal on the line and has connected to it.
- HS High Speed: (except 21/23 models)**  
This indicator is read in conjunction with the 22/22+ light, ie:  
If the 22/22+ light is ON while the:
  - i) HS light is ON then the SmartModem is in V22 bis or Bell 2400 mode, ie: 2400 bps
  - ii) HS light is OFF then the SmartModem is in V22 mode or Bell 212A mode ie: 1200 bps

If the 22/22+ light is OFF while the:

- i) HS light is ON then the SmartModem is in V23 mode, ie: 1200/75 or 1200 bps half duplex.
- ii) HS light is OFF then the SmartModem is in V21 or Bell 103 mode ie: 300 bps.

**HS High Speed: (21/23 model only)**

- i) HS light is ON then the SmartModem is in V23 mode, ie: 1200/75 or 1200 bps half duplex.
- ii) HS light is OFF then the SmartModem is in V21 or Bell 103 mode ie: 300 bps.

**AA Auto Answer: (except 21/23)**

This light, if on, shows the modem is waiting idle, but will answer the phone if it rings. See the Section in Chapter 4 - "Answering Calls Automatically". This light flashes for the Self Test (see below).

.....  
**NOTE:** The AA light will be off if  $ATS0 = 0$ .  
.....

**RI Ring Indicate: (21/23 models)**

This light is normally off and flashes when the phone line is ringing. some 21/23 modems have this light marked as "AA"

**TR Terminal Ready:**

This light indicates that the computer or terminal is ready. (DTR is raised.) The modem will raise DSR to the terminal when a connection to a remote modem has been established.

.....  
**NOTE:** RD and TR may be on even if the power is off.  
.....

**22+ Mode: (except 21/23 models)**

Refer to "HS" light description for details.

The "22+" light is only called "22" on 123A & SA models.

or...

**MR Modem Ready:**

This light is called "MR" on the 21/23 units; this means "Modem Ready".

.....  
**NOTE:** Read the section in Chapter 5 on synchronous operation for details on how to configure the front panel switches if your model has them. The front panel switches are only applicable to the "SA" versions of the SmartModem.  
.....

## **The Rear Panel**

---

Now turn your modem around and look at the back. This is where the action is:

- \* Two modular telephone jacks
- \* RS232 Data Cable Connector
- \* Eight DIP Switches
- \* Power Cable Connector
- \* ON/OFF Switch

.....  
*NOTE: The volume control for the speaker in your SmartModem is located underneath. You can change the volume with a small screwdriver. Turn clockwise or counterclockwise to increase or decrease the volume.*  
.....

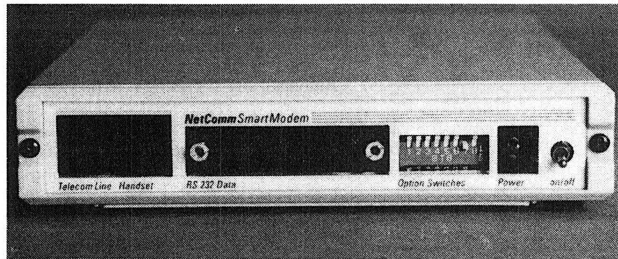


Figure 2-2. The Rear Panel

## **The Dip Switches**

---

.....  
*NOTE: This section is for advanced users. Skip it if you aren't sure and come back to it later.*  
.....

DIP means Dual In-line Package

The eight position DIP switch allows you to override certain aspects of the modem ability. This means when you turn it off and on again, the DIP switches dictate certain settings must remain.

.....  
*NOTE: The DIP switches ALWAYS override the software status of the SmartModem.*  
.....

There are eight switches and they are preset in the factory. The factory (standard or default) settings are shown '\*' thus below:

The DIP switches are operational in synchronous mode as well as asynchronous mode.

The first four switches control and support attributes of the terminal when it is attached to the SmartModem.

Switch Number	Name	Setting	Meaning
1	DCD Override	Up*	Modem supplies DCD on Connection. DCD permanently on.
		Down	
2	RTS/CTS Loop	Up *	CTS always from modem. CTS in response to RTS only.
		Down	
3	DTR Override	Up *	Terminal must supply DTR. DTR permanently on (supplied by modem).
		Down	
4	DTR/DSR Loop	Up *	DSR always supplied by modem. DSR is raised in response to DTR being raised.
		Down	

Switches 5 and 6 control the level of intelligence supported by the SmartModem.

5	Auto Answer	Up *	Auto answer is enabled. The modem will go on-line in answer mode. Answering incoming calls and dialling is done manually. The modem will go on-line in originate mode.
		Down	

---

**NOTE:** Switch 5 only used if Switch 6 DOWN (DUMB).

---



---

**NOTE:** Switches 5 and 6 are only read by the modem when it is turned off then turned on again.

---

6	Dumb Mode **	Up *	"Smart" Mode: The SmartModem recognises and responds to "AT" commands.
		Down	"Dumb" Mode: The SmartModem is controlled by the front switches or by the stored settings.

.....  
*NOTE: Read Chapters 3 & 4 on the meaning and use of the "AT" commands.*  
 .....

\*\* This switch is known as the "Dumb Mode" switch, because if the switch is down then the SmartModem no longer recognises "AT" commands. The operation of the SmartModem is governed by the position of the front panel switches (SA models) or previously saved parameters (A models).

7 & 8                      Unassigned

## **DUMB MODE**

The SmartModem "SA" models are able to be controlled using both the intelligent "AT" commands and/or using the front panel switches.

Setting the rear DIP switch 6 down disables the "AT" command recognition ability of the SmartModem, and therefore the modem will no longer recognise these commands. It is said to be in "Dumb Mode".

Dumb mode allows the "SA" SmartModem to be operated as a conventional manual modem. The switches on the front panel determine the required configuration.

In this mode the SmartModem can operate synchronously or asynchronously, at various speeds and in originate or answer modes. Refer to the appropriate sections below in this chapter to ensure that your modem is correctly configured.

.....  
*NOTE: For Dumb Mode operation, QUIET MODE ON "(Q1)" and ECHO OFF "(E0)" may also be required. This can be achieved and permanently stored away in non-volatile RAM by performing "ATQ1E0&W<CR> ". (See note on Quiet Mode below.)*  
 .....

## **Installing The Modem**

---

Setting up your SmartModem and connecting it to your computer or terminal is not difficult. The following list summarises the installation process described in some detail below:

1. You may notify Telecom that you are connecting a modem to their lines. You may need to order a dedicated telephone line.
2. Connect the modem to your computer or terminal with an RS232 cable.
3. Connect the power supply and switch power on (switch up).
4. Double-check your completed installation.
5. Run the built-in test to see that the modem is working properly.
6. Then go on-line to your host or service.

### **NOTIFY TELECOM**

Fill out the TS72 form and lodge it at any Telecom Business Office. This form once completed by you and then returned to you by Telecom is your permission for the connection or attachment of your SmartModem to the telephone system. Fill out the warranty page in this manual and mail it in too.

.....  
***NOTE:** We strongly advise you install a direct outside line for your SmartModem. If you wish to use an existing line we advise you get Telecom to install a "modem piggyback plug" (that's what Telecom call it). Read Appendix F about PABX Switchboards and Commanders.*  
.....

### **ELECTRICAL CONNECTIONS**

You need to make three electrical connections to finish installing your modem:

- \* Telephone connection to your modem.
- \* RS232 connection to your computer or terminal.
- \* Power connection.

#### **Telephone Connection**

In order for your SmartModem to communicate across the telephone lines, it must be properly connected:

Plug the telephone connection cable into the modem. Use the modular jack (the RJ11 plug). Now insert the Telecom 605 plug into the Telecom wall outlet you have selected.

Including a telephone in the circuit is optional. If you are using a phone line exclusively for modem communication, you may operate without a telephone connected.

A telephone will still work as it did before you attached your modem, except that the SmartModem is also able to answer the phone when you receive a call.

---

**WARNING:** When the modem is on-line, you cannot use the telephone handset. The modem must return to command mode or hang up first.

---

### RS232 Connection

---

**WARNING:** As always, be sure both the modem and the computer are switched off before connecting them together.

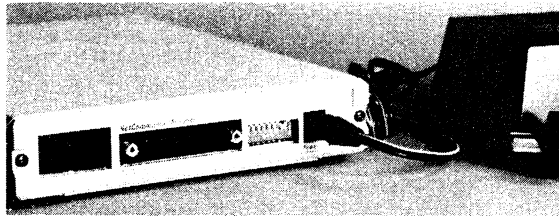
---

Plug the 25-pin D connector into the back of the SmartModem. Connect the other end of the cable to your computer or terminal using its RS232 serial port connector.

### Power Connection

The SmartModem is supplied with a special transformer that operates from any 240 V 50 Hz AC power source. The name plate on the SmartModem plug pack indicates the voltage, wattage and amperage ratings.

1. Find the plug pack, with power cable attached, that was supplied with your modem.
2. Flip the modem on-off switch down to the OFF position.
3. Plug the connector end into your modem.
4. Plug the power module end into an electrical outlet.



*Figure 2-3. SmartModem with Connections Made*



## **Testing Your Installation**

---

Your SmartModem responds to software commands typed by you or sent by your data communications program under asynchronous operation. The easiest and best way to test your installation is to run the SmartModem self-test procedure.

.....  
*NOTE: If you are unsure about the performance of this procedure, ask your dealer for assistance.*  
.....

To run the self-test, do the following:

1. Turn on your modem. The 22+ or MR light on the modem front panel should illuminate briefly. The AA light may also illuminate.
2. Turn on the PC and load the data communications program of your choice.
3. Enter Terminal Mode. Don't select Auto Dial (just yet!). The TR light on the modem should illuminate.
4. Type the modem command "AT Bn&T1" (where n is the number of the mode you want to test, from the range 0 to 15), then press <RETURN>. The letters "AT Bn&T1" should appear on the screen of your computer or terminal as you type them.

The message CONNECT will be displayed on your PC screen. The 'AA' light may start flashing.

5. When you see CONNECT on the screen, type in a short message - anything you want. The letters should appear on the screen as you type them.
6. Type in "+++", wait a while then type, "AT&T0" followed by <RETURN>. This will tell the SmartModem to finish its self-test. The modem responds with "OK". You are now ready to begin normal modem operation.

### **IF IT DOESN'T WORK**

If your SmartModem doesn't work the first time, go back and check your connections. Most problems can be traced to errors in installation.

Go through the following checklist step-by-step:

- \* Did you use the correct RS232 interface cable to connect your modem to your PC?
- \* Did you turn on your modem, computer and monitor?
- \* Did you connect your modem telephone cable to the Telecom wall socket?
- \* Did you plug the modem plug pack cable into the modem?

- \* Did you plug the modem plug pack into the wall outlet? Is this also switched on?
- \* Verify the setting of the DIP switches on the back of your modem.
- \* Did you configure your terminal or PC communications program correctly?

If the answer to all these questions is 'yes', and your installation still doesn't work, consult your local dealer.

## **Turning Up The Sound**

---

Sometimes you may need to adjust the volume of the speaker attached to your SmartModem. This is accomplished by adjusting a potentiometer on the underside of the modem (almost in the centre).

Turn off the power, unplug the power supply, phone cable and RS232 cable. Use a small straight screwdriver to adjust the volume control. Turn clockwise to increase the volume; anticlockwise to decrease the volume.

## **The SmartModem's Environment**

---

You can set up and operate your SmartModem in any reasonably clean, indoor location. It will work reliably over normal temperature ranges. You should not try to operate the modem outside.

If you are using a television set as a colour monitor, avoid placing it too close to the modem. Your SmartModem is sensitive to EMR and RFI.

EMR: Electro Magnetic Radiation.  
RFI: Radio Frequency Interference

-----  
**WARNING:** Certain kinds of electrical equipment, such as television, radios, and motors can generate stray magnetic fields or radio signals that may cause your modem to lose or scramble data, if the equipment is placed immediately adjacent to the modem.  
-----

The SmartModem's alloy case protects the modem adequately from dust and foreign objects, but it has little effect against liquids and vapours. Spilling any liquid on or inside your modem, or exposing it to chemical or solvent fumes, including steam from a coffee maker, can ruin your modem.

-----  
**WARRANTY WARNING:** There are no parts inside your SmartModem that require any upkeep. Do not try to remove the cover. You may void your Warranty and may also void Telecom's "Permit to Attach".  
-----

# Using the SmartModem

# ***Using the SmartModem***

# Chapter 3

## USING THE SMARTMODEM

### Getting On Line And Staying There

---

This section previews the design concepts and describes the various commands you can use. These let you take advantage of all of the features and in particular control the Asynchronous functions of the SmartModem.

.....  
*NOTE: Almost any communications program that controls a modem using the industry standard 'AT' command set (popularised in the USA by Hayes) can utilise the features of the SmartModem automatically. You need not take any action until the connection is dialled, established and (in some cases) until you have automatically logged on to the host.*  
.....

The SmartModem is intelligent, it is microprocessor driven. It has its own on-board program which recognises certain command codes that you send it from the keyboard or by program. Using these codes it can set itself up and commence operation, based on the information you supply.

.....  
*NOTE: Once the SmartModem is on-line to your remote connection it is unable to accept any more command codes except the "escape sequence" (see below). Everything you type in or send under program control will be transmitted to the remote host. The modem can only accept further commands when it is switched into local command mode (by the escape sequence) or if the line is hung up.*  
.....

The SmartModem family implement a superset of the Hayes (R) "AT" command format as defined in the US by Hayes Microcomputer Products Inc (for their 2400 modem). A summary of the commands is given in Appendix G. A reference card showing the same information is packed with your modem.

## **Design Concepts**

---

### **SYNCHRONOUS/ASYNCHRONOUS**

The SmartModem family has been designed to operate in both synchronous and asynchronous modes. Asynchronous autodialling is a standard feature in both modes.

21/23A model doesn't support synchronous operation

When the SmartModem is powered on it configures itself according to the previously saved options. These options tell the modem to either stay in asynchronous mode or switch over to synchronous mode when the connection is established.

The SmartModem parameters are set up using an asynchronous terminal (even for the synchronous details). The parameters are set up in the factory to sensible values, but these may be altered to suit your requirements, and saved in the SmartModem's non-volatile RAM

The SmartModem has a number of different methods of automatically getting into synchronous on-line mode, see the &M command in Chapter 5. The differences between them revolve around the autodialling method.

Method 1 involves the SmartModem dialling in asynchronous mode and swapping to synchronous operation when the connection is established. This requires the computer or terminal to also be able to switch from asynchronous to synchronous.

Method 2 involves the connection being established using a telephone handset to dial the phone number. The SmartModem is switched into synchronous mode by raising the DTR signal.

The SmartModem is also capable of being controlled manually ("SA" models only). The Front Panel switches can be set to configure the SmartModem for differing speeds and synchronous or asynchronous operation.

You should use "SA" models for synchronous applications as they often need to be manually controlled.

These are all covered in detail in Chapter 5. The rest of this chapter covers modem control and Asynchronous operation.

### **NON-VOLATILE RAM**

In order to simplify its operation the SmartModem has the ability to store details of its setup. These details can be retained even when the SmartModem has been powered off. They are stored in an area of the SmartModem called "non-volatile RAM" (Random Access Memory).

After initial setup, every time the modem is powered on, or the reset command is issued, the configuration of the modem is restored from non-volatile RAM.

The "&W" command is used to store the current configuration of the SmartModem. That configuration remains until the next "&W" command is issued.

## COMMAND CONTROL

The SmartModem has two levels of operation - the local command state and the on-line state. When you turn the SmartModem on it automatically "powers up" in the local command state. Certain commands given by you or your communications program flip the SmartModem between local command and on-line states.

Local command state allows the selection of options like echo, monitoring the speaker, and other control parameters. These are all described in detail below.

On-line state is achieved by issuing a "dial" command ("ATD...."), in which case the modem goes on-line but as configured by earlier local commands. There are other commands to allow the modem to go on-line, for example, answer ("ATA").

Most modems need to be set up in one of two modes, Originate mode, when the modem originates a call and Answer mode, when it accepts an incoming call.

The SmartModem, however, automatically selects Originate when it dials and automatically selects Answer when you issue the Answer command. This is also the default mode.

Normally when it is switched on it will automatically answer when the phone rings.

.....  
***NOTE:** If you're calling a dumb originate only modem, you can set the SmartModem to reverse mode after you initiate the connection.*  
.....

To assist in controlling the SmartModem, it outputs response messages or codes to show what state it is in. These may be numeric or verbal for you or a program to inspect and act upon. (They may also be suppressed.)

Whilst on-line the SmartModem cannot execute commands, it must be set back to local command mode first. This is done by entering the "escape sequence" and also occurs if the modem loses the phone connection. Figure 3-1 shows the paths between local command and on-line modes.

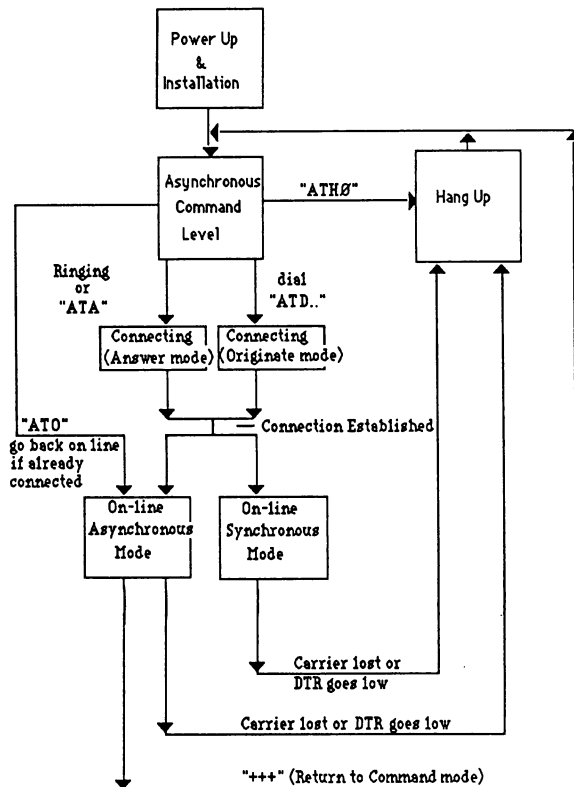


Figure 3-1. Command State Paths

## Modem Commands

A SmartModem command consists of a series of characters that control your modem in one way or another. The modem commands used to control your SmartModem can be grouped into:

- \* General Commands -- how to control the state of your modem and some of its characteristics.
- \* Dial Commands -- how to get the modem to dial and connect for you.
- \* Answer Commands -- allow you to control the answering performance of your modem.



.....  
***NOTE:** To escape from On-Line mode wait one second, then type the escape sequence "+++", and wait one second. (This escape feature is disabled in Synchronous mode. See Chapter 5.)*  
.....

**Command String:** A series of characters, usually abbreviated, which order the modem to take a specific action.

Modem commands are organised into a line of letters and numbers called a command string. The order in which the command string is typed determines the order in which the modem obeys the command. The modem won't execute a command string until you press <RETURN> (except for the Redial command and escape sequence).

Unless otherwise noted "Carriage Return", "Return" and "Enter" all mean the same thing.

## COMMAND PREFIX

You may generally enter commands in any order, but the letters "AT" must appear at the start of every command string (these stand for ATTENTION) and a Carriage Return must terminate the string. Commands may be concatenated into one command line.

.....  
***NOTE:** Modem commands are normally used only to switch between data modes, and to set control values that cannot be set in the communications program.*  
.....

## TYPING MODEM COMMANDS

As mentioned above, the modem powers up in local or command mode automatically when it is turned on. You can tell when your modem is in the Command Mode when you see the response message "OK" or "NO CARRIER" displayed.

The letters "AT" are used to start a new command string. Command letters and numbers should be typed together without spaces in between. Commands may be mixed in any order, provided the Answer, Dial and Reset commands are the last in the command string.

Use <BACKSPACE> to move the cursor back and correct any errors. <RETURN> is used to complete the command.

-----  
**IMPORTANT:** The letters "AT" must be typed correctly -- do not backspace, or the command may be ignored.  
-----

Once the command has been entered it is stored in a buffer of 40 characters. It is then processed serially from that buffer. If you try to type in more than 40 characters the buffer will overflow and you will get the message ERROR. The "AT", Carriage Return and any spaces are not included in the count of 40 characters.

-----  
*NOTE: From here on "<CR>" will be used to indicate you should press the Carriage Return or Enter Key.*  
-----

## Matching Dissimilar Modes And Speeds

When power is applied to the SmartModem, the speed chosen defaults to the value previously stored in the non-volatile memory. The rates that may be stored include 300, 1200 and 2400 bps. "AT" commands may be issued at any of these speeds. Each time the SmartModem receives a new "AT" command line, the communications rate at which this command line is issued replaces the current default rate. When the SmartModem is on-hook (that is the line is "hung up") the active communications rate will always reflect the rate at which the most recent AT command was issued, or the speed of the last connection.

When the SmartModem attempts to establish a connection with a remote modem which is configured for a different communications rate, the SmartModem may automatically adjust its speed to agree with that of the remote modem in order to complete the connection. See the section called "Auto Ranging" below.

If extended result codes are selected (see the "X" command in Chapter 4), the SmartModem informs the local terminal of this communications rate change by returning a CONNECT message at the communications rate of the last rate set, while showing the rate at which the connection is established following the CONNECT result code.

For example, if the dial command is issued at 2400 bps, and the remote station is configured for 1200 bps operation, the local SmartModem establishes the connection at the 1200 bps rate, and returns the message "CONNECT 1200" to the local data terminal. The SmartModem transmits this message at the 2400 bps rate. It then adjusts the rate at which it communicates with the local terminal to 1200 bps. It will no longer recognise data received from the local terminal at the 2400 bps rate. It is the responsibility of the local terminal to determine the communications rate from the CONNECT XXXX result code and adjust its speed accordingly.

-----  
**WARNING** It is your responsibility (or your program's) to ensure that you set the speed of the serial port to match that of the modems, once the connection has been made.  
-----

### **Auto Ranging**

---

This feature is best described by example; the same principle applies to all models.

The SmartModem 1234 attempts to answer at 2400 then, if it can't connect, at 1200 bps and then 300 bps. Both BELL and CCITT standards are reviewed.

The Auto Ranging capability now allows the SmartModem to automatically detect and connect to the vast majority of modems when answering.

An "Answer" modem will connect to any normal (Manual & Auto) modem calling in.

The "CONNECT XXXX" message will show the speed at which the modem has connected after which all messages and data transmitted to the locally connected PC, terminal or host are sent at that new speed. This is in conformance with the HAYES standard; all US software is compatible with this.

The SmartModem 21/23 attempts to answer at 1200/75 bps and 300 bps.

The SmartModem 1200 attempts to answer at 1200 bps, then 300 bps if it can't connect at 1200.

The SmartModem 2400 attempts to answer initially at 2400 bps then at 1200 followed by 300 bps.

The SmartModem 123 & 1234 Auto Range over all supported speeds and standards.

Read the section "Auto Ranging" in Chapter 4 below.



# **SmartModem Commands**

# SmartModem Commands

# Chapter 4

## SMARTMODEM COMMANDS

### General Commands: Swapping Modes: Resetting the Modem:

General commands are used to determine how the modem and computer communicate. Certain commands and options only apply to specific modes of operation.

#### DEFAULT SETTINGS

The DIP switches on the rear panel can be used to permanently (ie: after power off) modify the modem's standard settings. Where this Chapter refers to "defaults", this means the factory defaults and it assumes the DIP switches are set per Chapter 2.

#### ESCAPE SEQUENCE "+++":

The Escape Sequence puts the SmartModem back to local command mode from on-line. Its format is fixed but the parameters may vary.

The format is: Time Delay followed by a character entered 3 times, followed by Time Delay. The Default Time Delay is one second, while the default character is "+" (the 'plus' sign).

To enter the Escape sequence, using the default values, enter the following:

- Wait at least 1 second (after the last character was entered).
- Type in +++
- Wait at least 1 second (before trying to transmit another character).

You will know that you're back in local command mode when you see the modem respond "OK". The telephone line at this stage is not released; this only happens when the Hang Up command ("ATH0" - see below) is issued, or if the modem detects DTR dropping.

The Time Delay either side of the Escape Characters is a protection mechanism to avoid the case where the three escape characters could be part of a message.

-----  
**WARNING:** When in answer mode, it is recommended that the escape sequence be disabled or set to a value other than that used by the originator. See the section "Available Special Registers" later in this Chapter, Registers 2 and 12.  
-----

### ON-LINE COMMAND "O":

To return the SmartModem to on-line mode from local command mode issue the "O" command (letter O). Enter:-

ATO or ATO0<CR>	to go back on line
ATO1<CR>	2400 bps only to go back on-line and initiate an equaliser retrain (only used if high error rates are encountered due to loss of equalisation).

### HANG UP COMMAND "H":

This command causes the SmartModem to hang up the telephone line. It is issued from the local command state after the escape sequence ("+++") has been issued.

H0	Hang up the telephone line (go "on hook").
or H	
H1	Pick up the telephone line (go "off hook").

### IDENTIFICATION COMMAND "I":

This command is used to display the product identity and version number.

Format is:        I0 or I

In display numeric response mode ("V0") the 21/23, 1200 and 123 models respond with "123" while the 2400 and 1234 models respond with "243". These responses are expected by some software applications.

In display verbal response mode ("V1") full product identity is displayed. This information is often required when providing customer support.

### RESET COMMAND "Z":

The Reset Command is issued to return the SmartModem to a known state. It resets all of the registers and parameter values to the values which have been stored in non-volatile memory. Enter:-

ATZ <CR>

### MONITOR ECHO COMMAND "E":

When the modem is in local command mode this command can display the characters you type on the keyboard on your screen: Use:-

E0 (or E)	turns OFF the command echo.
E1	turns ON the command echo.



**TRANSMISSION MODE "B":**

The 'B' command is used to determine the appropriate mode for the speed selected.

.....  
**NOTE:** *Ninety percent (90%) of users will only use B0, B1, B2. Only users who need sophisticated Auto Ranging or fixed mode operation will need to consider B3 to B15.*  
 .....

If you select a "B" value, and then start dialling at a particular speed (i.e. you or your PC issue "AT" commands at 300, 1200 or 2400) the modem automatically adopts the mode shown in the "Originate" Column. For example:-

B0 + originate speed of 1200 = V23 mode  
 B2 + originate speed of 300 = V21 mode  
 B1 + originate speed of 1200 = Bell 212 mode  
 B2 + originate speed of 1200 = V22 mode

Command Setting	Auto Range ON/OFF	Specification	Originate			Answer Sequence (Range Group Order)			Note
			300	1200	2400				
B0	ON	CCITT	V21	V23	V22bis <sup>1</sup>	V23	V22 <sup>1</sup>	V21	
B1	ON	Bell	103	212	2400 <sup>1</sup>	V22 <sup>1</sup>	V21	V23	
B2	ON	CCITT	V21	V22 <sup>2</sup>	V22bis	V22 <sup>1</sup>	V21	V23	
B3	OFF	CCITT			300 (V21)				
B4	OFF	Bell			300 (103)				
B5	OFF	CCITT			1200/75 (V23)				
B6	OFF	CCITT			1200 (V22)				
B7	OFF	Bell			1200 (212)				
B8	OFF	CCITT			2400 (V22bis)				
B9	OFF	Bell			2400 (2400)				
B10	ON	CCITT	V21	V23	V22bis <sup>1</sup>	V23	V21	V22 <sup>1</sup>	
B11	ON	CCITT	V21	V23	V22bis <sup>1</sup>	V21	V23	V22 <sup>1</sup>	
B12	ON	CCITT	V21	V23	V22bis <sup>1</sup>	V23	V22 <sup>1</sup>	V21	
B13	ON	CCITT	V21	V22 <sup>2</sup>	V22bis <sup>1</sup>	V21	V22 <sup>1</sup>	V23	
B14	ON	CCITT	V21	V22 <sup>2</sup>	V22bis <sup>1</sup>	V22 <sup>1</sup>	V23	V21	
B15	ON	CCITT	V21	V22 <sup>2</sup>	V22bis <sup>1</sup>	V22 <sup>1</sup>	V21	V23	

1 means autorange V22bis, Bell 2400, V22, Bell 212, Bell 103

2 means autorange V22, Bell 212, Bell 103

**Note:** The following models only support the modes shown;

21/23: V21, V23, Bell 103  
 1200: V22, Bell 103, Bell 212  
 2400: V22, V22 bis, Bell 103, Bell 212, Bell 2400  
 123: V21, V23, V22, Bell 103, Bell 212  
 1234: V21, V23, V22, V22 bis, Bell 103, Bell 212, Bell 2400

### MONITOR COMMAND SPEAKER "M":

This command controls the monitor speaker:

- |    |  |
|----|--|
| M0 | turns the speaker OFF.   |
| M1 | turns the speaker ON when going Off-Hook while dialling or answering. The speaker turns off when the modem recognises a return carrier tone from another modem. This is the default command. |
| M2 | turns the monitor speaker ON when going Off-Hook while dialling or answering and remains on until the line is disconnected.  |

### RESPONSE CODE COMMAND "V":

A Response Code is the message the SmartModem displays on your screen to prompt you to type commands or data, to report whether the telephone line is connected or disconnected, or to report an error. Each message has a number and/or a string attached to the code.

- |         |                                   |
|---------|-----------------------------------|
| V0 or V | displays numeric responses.       |
| V1      | displays verbal (text) responses. |

See the section "Response Codes" below.

### QUIET COMMAND "Q":

This command either displays modem response messages on your screen, or suppresses them:

- |         |  |
|---------|--|
| Q0 or Q | sends modem response messages to your monitor screen. (Quiet OFF.)         |
| Q1      | stops the modem from sending response messages to your screen. (Quiet ON). |

### SELF-TEST COMMAND "&T":

There are six forms of the "&T" command. These initiate the Local or Remote Loopback tests. The tests are designed to give confidence that the modems and telephone line connection are working satisfactorily. They are described in detail in Chapter 6.

- |           |  |
|-----------|--|
| &T0<br>&T | halts any test currently in progress.  |
| &T1       | starts a Local Analog Loopback test. This is carried out in accordance with CCITT standard V.54, L3.         |
| &T4       | permits the local modem to grant a request from the remote modem for a Remote Digital Loopback (L2) test.    |
| &T5       | stops the local modem from granting a request from the remote modem for a Remote Digital Loopback (L2) test. |

&T6 start a Remote Digital Loopback test according to CCITT Standard V.54, L2.

## **Dialling Commands**

All Dial Commands are preceded by "D" , which causes the modem to interpret all numbers appearing after the "D" as a telephone number that it must dial. Certain characters act as further commands to modify the dial process, <CR> completes the dial command.

.....  
**REMEMBER:** *if you use the Dial Command by itself you must precede it with "AT".*  
 .....

The SmartModem will automatically originate a telephone call in response to the dial command. The extra commands which are used to modify the dialling process are:

"	Pause. Causes the SmartModem to pause for a predetermined time (usually two seconds - see Register 8) during the dialling sequence. Useful in waiting for an outside line after dialling through a PABX.
"T"	Use Tone Dialling.
"P"	Use Pulse Dialling.
"R"	Reverse mode. Puts the SmartModem into "answer" mode after firstly dialling an originate only modem. Must be the last character in the dial string before the <CR>.
";"	Return to command state after dialling the telephone number. Don't go online. Useful, for example, when in tone dialling mode to enter information like customer ID or password to banking services etc.

.....  
**NOTE:** *You must terminate the dial command with a Carriage Return to cause the SmartModem to correctly wait for a carrier signal. You can cancel the dial process by pressing any key at any time before connection on-line. The SmartModem automatically returns to local command state after a predetermined delay (usually 30 seconds - see Register S7) when no connection can be made.*  
 .....

### DIAL A NUMBER "Dnnn":

The format of the phone number is "nnn" where "nnn" is a string of characters, some of which may be valid SmartModem Dial Commands intermingled with the digits of the phone number,

eg: ATD1234567<CR>

that is, Attention, Dial the telephone number "1234567" then wait for carrier tone from the remote modem. If no carrier is detected the SmartModem releases the telephone line and outputs a NO CARRIER response code. If a carrier tone is detected, the CONNECT response code is output and the SmartModem goes to on-line mode.

### PAUSE ",":

The comma is used to insert a pause (the normal pause is 2 seconds) during the dialling of a telephone number. This is most commonly used in dialling through a PABX to allow a pause whilst getting an outside line,

eg: ATD9,1234567<CR>

that is, Attention, Dial 9, pause 2 seconds, dial "1234567".

### TONE AND PULSE DIALLING "T" or "P":

The SmartModem is capable of DTMF (Tone) and Pulse (Decadic) dialling, even intermingled within the same dial command,

eg: ATDP9,T1234567<CR>

that is, Attention, Pulse Dial "9", Pause, Tone dial "1234567"

### ORIGINATING A CALL IN ANSWER MODE "R":

The SmartModem normally dials in originate mode. The "R" command allows the modem to dial someone with an originate-only modem and after dialling it leaves the SmartModem in answer mode.

eg: ATD1234567R<CR>

that is, Attention, Dial "1234567" switch the SmartModem to answer mode (Reverse) and wait for the other end to transmit the originate carrier tone.

### REDIAL LAST NUMBER "A":

The redial command, repeats the last "AT" command (surprise!). Generally it is used to redial the last telephone number dialled. "A" is used in place of "AT" and no <CR> is required,

eg: A/

### RETURN TO COMMAND STATE "":

The SmartModem can be forced to re-enter the local command state after dialling (without hanging up) by finishing the dial command with a semi-colon. This is useful, for example, when calling a phone order service or bank service.

After a connection is made, you may be required to use Touch-Tones to enter additional information (eg: customer ID, password). This is used commonly used throughout the USA. Example:-

Type:	ATD1234567;<CR>	(dial telephone number and return for command)
Response:	OK	
Type:	ATDT45678;<CR>	(transmit ID number and return for command)
Response:	OK	
Type:	ATD1234;<CR>	(transmit password and return for command)
Response:	OK	
Type:	ATD4760;<CR>	(enter transaction and return for command)
Response:	OK	
Type:	ATH0<CR>	(Hang up)
Response:	OK	

.....  
*NOTE: Characters not in the above command set are ignored during the dial command; that is, no error message is generated. This allows punctuation (for example with spaces) in the telephone number for easy reading,*

*eg: Enter ATDT 9, 1234567, <CR>*

.....

### SETTING THE REGISTERS: THE "S" REGISTERS:

Timing parameters in the dialling sequence (and elsewhere in the modem performance) are controlled by values assigned to special registers in the SmartModem. The function of each of these registers (S0 through S27) and their default values are listed in the table "Available Special Registers" later in this chapter. They control such parameters as length of time before dialling starts, to wait for carrier, for the escape guard time, dial pause, etc.

Use the "S" Command to change the values assigned to these registers. For example, if you normally have difficulty getting a dial tone, that is if the SmartModem begins to dial before the dial tone appears, then increase the value of the S6 register,

eg: ATS6=3<CR> (Wait 3 secs before dialling)

.....  
*NOTE: Not all registers from S0 to S27 are used.*

.....

## COMMAND FORMAT

"T", "P" and "R" should be used from within the dial command. Other commands should be placed before the "D" command. If the command is terminated with a semi-colon, then additional commands may follow but must be terminated with <CR>.

eg: AT M2 V1 DT 1234567<CR>

The previous example instructs the SmartModem to:

M2	keep the speaker on
V1	send word response codes
DT	Tone Dial 1234567

## Answering Calls Automatically

The SmartModem is automatically in Answer mode and unless it is:

- a) dialling,
- b) performing a local test, or
- c) switched off,

it will "answer the phone" if a call is received.

The section below describes the commands that change or alter the way the SmartModem answers incoming calls and goes on-line. Use these commands, for example, when you wish to dial into your computer from a remote location.

## CONTROLLING AUTO ANSWER:

The S0 special register controls the number of rings, if any, that must occur before the SmartModem answers a call. The register may range in value from 0 - 255.

S0=0	Do not answer telephone
S0=1	Answer on Ring 1
S0=2	Answer on Ring 2
:	
:	
S0=123	Answer on Ring 123
:	
:	
S0=255	Answer on Ring 255

When the register is set to 0, the auto-answer option is not in effect. You may set the SmartModem so that it will answer on the first ring, the sixth ring, and so on. Often the telephone system will terminate an unanswered call after a minute or so.

As long as the power to the modem remains on, the SmartModem answers the telephone call on the current value of the S0 register. When power to the SmartModem is turned off and then on again, or a "Z" (reset) command is given, the SmartModem resets the default value of the S0 register.

### AUTO-ANSWER PROCESS:

When the telephone rings, the SmartModem counts the rings and then answers (see S0 register). The SmartModem then sends a carrier signal to the originating (calling) modem and waits for the other modem to send its carrier signal.

If no carrier signal is received from the originating modem within a specified time (usually 30 seconds), the SmartModem hangs up, sends a NO CARRIER response and returns to the local command state.

If the carrier signal is received then the SmartModem sends a CONNECT response code and goes on-line.

### AUTO RANGING

This capability allows the SmartModem to automatically detect and connect to the vast majority of modems, both Bell and CCITT standards, when answering an incoming call.

The SmartModem (depending on the particular model) can now detect the speed of a modem which attempts to connect with it at:

-	2400 bps	CCITT and Bell
-	1200 bps	CCITT and Bell
-	1200/75 bps	CCITT
-	300 bps	CCITT and Bell

The setting selected in the "B" register dictates the speed, sequence and timing of this Auto Ranging.

Command Setting	Auto Range ON/OFF	Specification	Originate			Answer Sequence			Note
			300	1200	2400	(Range	Group	Order)	
B0	ON	CCITT	V21	V23	V22bis <sup>1</sup>	V23	V22 <sup>1</sup>	V21	
B1	ON	Bell	103	212	2400 <sup>1</sup>	V22 <sup>1</sup>	V21	V23	
B2	ON	CCITT	V21	V22 <sup>2</sup>	V22bis	V22 <sup>1</sup>	V21	V23	
B3	OFF	CCITT			300 (V21)				
B4	OFF	Bell			300 (103)				
B5	OFF	CCITT			1200/75 (V23)				
B6	OFF	CCITT			1200 (V22)				
B7	OFF	Bell			1200 (212)				
B8	OFF	CCITT			2400 (V22bis)				
B9	OFF	Bell			2400 (2400)				
B10	ON	CCITT	V21	V23	V22bis <sup>1</sup>	V23	V21	V22 <sup>1</sup>	
B11	ON	CCITT	V21	V23	V22bis <sup>1</sup>	V21	V23	V22 <sup>1</sup>	
B12	ON	CCITT	V21	V23	V22bis <sup>1</sup>	V23	V22 <sup>1</sup>	V21	
B13	ON	CCITT	V21	V22 <sup>2</sup>	V22bis <sup>1</sup>	V21	V22 <sup>1</sup>	V23	
B14	ON	CCITT	V21	V22 <sup>2</sup>	V22bis <sup>1</sup>	V22 <sup>1</sup>	V23	V21	
B15	ON	CCITT	V21	V22 <sup>2</sup>	V22bis <sup>1</sup>	V22 <sup>1</sup>	V21	V23	

1 means autorange V22bis, Bell 2400, V22, Bell 212, Bell 103

2 means autorange V22, Bell 212, Bell 103

Note: The following models only support the modes shown;

21/23: V21, V23, Bell 103

1200: V22, Bell 103, Bell 212

2400: V22, V22 bis, Bell 103, Bell 212, Bell 2400

123: V21, V23, V22, Bell 103, Bell 212

1234: V21, V23, V22, V22 bis, Bell 103, Bell 212, Bell 2400

For the modem to answer a call and attempt to connect with the remote modem in CCITT V22 mode followed by V23 then V21 (i.e. 1200, 1200/75 then 300 bps) you would issue the following command before the incoming call was received:

ATB14 <CR>

The modem would attempt to connect with the remote modem for 10 seconds in each mode before hanging up the line.

The value of the "B" command may be stored in Non-Volatile Ram, thus allowing the modem to always power up in the correct answer mode. Issue the command:

AT&W <CR>

when you have selected the mode you require. (This saves that particular mode setting.) See the Section titled "Write Current Values" below.

The order in which the SmartModem attempts to detect the speed of the remote modem and the length of time it tries is also user modifiable.

The order of the autoranging, through each range, is determined from the setting of the "B" command.



There are three (3) range "groups":

<u>RANGE</u>	<u>SPECIFICATION</u>	<u>SPEED</u>
1	CCITT V.21	300
2	CCITT V.22 bis	2400
	Bell 2400	2400
	CCITT V.22	1200
	Bell 212A	1200
	Bell 103	300
3	CCITT V.23	1200/75

Vary the value of register "S11" to alter the amount of time spent in each range. Enter:

ATS11=n<CR>

where n is a value from 5 to 20.

e.g.: ATS11=15<CR>

tells the SmartModem to spend 15 seconds attempting to connect in each range. See the Section "Available Modem Control Registers" below.

---

**WARNING:** If you have difficulty in connecting using auto ranging, please see Appendix I.

---

Register S11 specifies the time in seconds for the modem to attempt to connect to the carrier on the remote computer, in each range group. This register is known as the Autorange Detect Time Register. See also the &A command.

---

**NOTE:** The autoranging facility may be stopped by specifying particular values for the "B" command.

---

### THE ANSWER COMMAND "A":

The Answer Command forces the SmartModem to answer the telephone without waiting for a ring, that is, answer immediately, eg:

eg: ATA<CR>

The SmartModem immediately answers a call (ie: "lifts up" the handset "off hook") and waits for a carrier signal; it will not execute any command entered in the command line after "A". Additional commands must be placed before the A command.

---

**NOTE:** Use "ATD <CR>" to answer the phone in originate mode.

---

## More General Commands

---

### SETTING THE REGISTERS: MORE "S" REGISTERS:

In addition to the S0 register, you have the option of adjusting the values of each register; the default values are summarised in the table, "Available Special Registers" later in this chapter.

### WRITE TO "S" REGISTERS "S=":

This command allows any of the special "S" registers to be modified. The particular function of each register is described later in this chapter.

Sn=p    n = register number from 0 to 27  
           p = register value from 0 to 255

eg:    Command -    ATS4 = 10<CR>  
        Response -    OK

### READ "S" REGISTERS "S?":

This command allows the special "S" registers to be read. The particular function of each register is described later in this chapter.

Sn?    n = register number from 0 to 27

eg:    Command -    ATS0?<CR>  
        Response -    002 ie: register S0  
        OK            has a value of 2.

.....  
*NOTE: not all S registers from 0 to 27 are used.*  
 .....

### EXTENDED RESPONSE CODE COMMAND "X":

This command is used to signal the result of a SmartModem Dial or Answer command.

X0    Send the message CONNECT once a connection  
 or X    has been made.

X1    The SmartModem sends the message:

CONNECT	-	300 bps
CONNECT 1200	-	1200 bps
CONNECT 2400	-	2400 bps

as appropriate, after a connection has been established.

**SYNCHRONOUS/ASYNCHRONOUS COMMAND "&M":**

This SmartModem command is used to select between synchronous or asynchronous mode. Synchronous operation is covered in Chapter 5.

- &M0** Asynchronous only Automatic operation.  
or **&M**
- &M1** Synchronous Mode, ie: Synchronous operation with Asynchronous dialling. In this mode the telephone call is dialled using the standard asynchronous method. When the connection is fully established the SmartModem is switched to Synchronous operation.

**GUARD TONE COMMAND "&G" (V22 & V22 bis only):**

This command controls the generation of guard tones.

- &G0** The SmartModem will not generate guard tones.  
or **&G**
- &G1** Guard tones at the frequency of 550 Hz will be generated.
- &G2** Guard tones at the frequency of 1800 Hz will be generated.

**LONG SPACE DISCONNECT COMMAND "Y" (V22, V22bis only):**

The "Long Space Disconnect" command is used to disconnect the SmartModem if it receives a continuous BREAK condition from the remote modem for a period of 1.6 seconds or greater. The local modem sends a BREAK for four (4) seconds and goes on-hook if it is sent the "H0" command, or DTR goes low, when Long Space Disconnect is turned on.

- Y0** Turn off Long Space Disconnect.  
or **Y**
- Y1** Turn on Long Space Disconnect.

**CARRIER DETECT COMMAND "&C":**

This command gives the SmartModem control over the Carrier Detect signal (DCD) it issues.

- &C0** Carrier Detect is always on.  
or **&C**
- &C1** Carrier Detect follows the state of the data carrier from the remote modem.

-----  
**WARNING: The DIP switches override this command.**  
**See Chapter 2, "The DIP Switches".**  
-----

### DATA TERMINAL READY COMMAND "&D":

This command allows the SmartModem to override the state of the Data Terminal Ready (DTR) signal it receives.

- &D0 The Modem ignores the terminals signal and acts as if the or &D DTR signal is always high.
- &D1 The SmartModem will operate normally following the terminals setting of DTR. The Modem will not Answer or Dial unless DTR is raised, whether in Asynchronous or Synchronous mode.

-----  
**WARNING:** The DIP switches override this command.  
See Chapter 2, "The DIP Switches".  
-----

### GENERATE TRANSMIT CLOCKS COMMAND "&X":

This command allows the SmartModem to nominate the source of the Transmit Clocks in synchronous mode, except in V.23 mode.

- &X0 The SmartModem generates the clocks on pin 15 and 17 of the or &X RS232 connector. Normal operating mode.
- &X1 The clocks generated by the PC/terminal are received on pin 24 of the RS232C connector and output on pin 15. This is known as external clocking.
- &X2 Clocks are received from the incoming data carrier signal of the host and are output on pin 15 of the RS232C connector. This is known as slave clocking.

### READ FACTORY DEFAULT PARAMETERS COMMAND "&F":

This command reads in the factory default values of the Special registers.

The format is:     &F

The factory defaults are highlighted on the Quick Reference Card and in Appendix G.

-----  
*NOTE: The &F command should be followed by an &W command if you want to write the factory default parameters into non-volatile memory. i.e. AT&F&W.*  
-----

### WRITE CURRENT PARAMETERS TO NON-VOLATILE MEMORY COMMAND "&W":

The &W command writes away the current Parameters into non-volatile memory.

The saved parameters are restored after issuing the "Z" command or powering the SmartModem on.

The format is:     &W

### ANSWER TONE SEQUENCE "&A"

The &A Command allows you to modify the Answer tone sequence performed by the SmartModem.

This command may take the value of 0 or 1. The default value is 0.

The format is:     &An

n=0 means that full Answer Tone sequence is performed on the first range but not on the second and third ranges in the order specified by the "Bn" command.

n=1 means that full Answer Tone sequence is performed, on each range, in the order specified by the "Bn" command.

e.g.: AT&A1<CR>

indicates that full Answer Tone sequence is to be followed on all three ranges.

.....  
*NOTE: Each Answer Tone Sequence lasts approximately 5 seconds.*  
.....

### RTS/CTS SIGNALS IN ASYNCHRONOUS MODE

The Clear to Send RS232 signal (CTS) is permanently raised by the SmartModem, except when the videotex mode of CCITT V.23 (ie: 1200/75 bps operation) is selected.

When the modem is configured for V.23 mode only (ie: 1200/75 bps) the CTS signal is raised, except when the output buffer is full. When this output buffer (approximately 40 characters) fills, CTS is lowered until the buffer is partially emptied. Once more space is available in the output buffer CTS is again raised. Data should not be sent from the PC or terminal to the modem while CTS is low.

Programs which are not capable of checking the status of this signal may lose data while the buffer is full.

**Response Codes**

---

The modem Response Codes, output to the computer or terminal by the modem to show acknowledgement of commands, are listed below.

Code (Digit)	Code (Characters)	Description
0	OK	Command line accepted and executed.
1	CONNECT	Carrier detected at 300.
2	RING	Ringing signal detected.
3	NO CARRIER	Carrier lost or not detected.
4	ERROR	Command line longer than 40 characters.
5	CONNECT 1200	Carrier detected at 1200/75 bps, if V.23 selected; or at 1200 bps, if V.22 or Bell 212 selected.
6 - 9	—	Not used.
10	CONNECT 2400	Carrier detected at 2400 bps.

**Available Special Registers**

Register	Saveable?	Value	Default	Function
0	Y	0-255	01	Answer incoming call at "p"th ring. (0 = do not answer. Modified by DIP switch in Dumb mode).
2	Y	0-127 or 255	43	Decimal Value for Escape Code Sequence. (A value of 255 will disable Escape Code sequence recognition).
3	Y	0-127	13	Decimal Value for Carriage Return.
4	Y	0-127	10	Decimal Value for Line Feed Character.
5	Y	0-127	08	Decimal Value for Backspace Character.
6	Y	1-30	02	Wait time, for dial tone, in seconds.
7	Y	1-60	30	Time, in seconds, to wait for carrier.
8	Y	0-30	02	Length of dial pause, in seconds.
9	Y	1-255	12	Carrier detect response times (1/10 second).
10	Y	1-255	14	Carrier loss response time. Delay time after loss of carrier before hang up. Carrier loss to hang up delay is (S10-S9) in 1/10 second.

.....  
**NOTE:** If you set "S10=255" the modem will not hang up the connection if carrier is lost. You must subsequently use "ATH0<CR>", or drop DTR.  
 .....

11	Y	1-255	10	Auto Ranging Detect Time (seconds).
12	Y	3-255	50	Escape sequence delay time, 1/50th of a second.
18	Y	0-255	60	RTS Loss Time Register (seconds)

## Sample Commands

---

Here are some sample commands. Look at them first then try them from your keyboard. (Terminate each command with <CR>.)

Command	Definition
AT&T1<CR>	Self Test Command. This is the command that starts the modem self-test procedure, checking that the modem is properly connected, turned on and functional.
ATS0=6 <CR>	This command string sets the S0 register to answer a telephone call on the sixth ring. This is how you give yourself a chance to answer first when the phone rings.
ATDP9, 1234567 <CR>	ATTENTION command, Dial the following number, using Pulse and pause after digit 9 (eg: going through a PABX).
ATE1M0V0<CR>	ATTENTION command, Echo all commands, turn the speaker off and return response codes as digits.
ATQ0E1DT0,P00111,T714 7340221 <CR>	This command string tells the modem to display all modem response codes and modem command characters on your screen and then dials an overseas (USA) telephone number using Tone, Pulse, and Tone dialling.
ATS7=20S0=1V1M2DT9,,P01955 <CR>	This command tells the carrier register S7 to wait 20 seconds for a carrier before hanging up. Then it tells the modem to answer the telephone on the first ring, display response codes as verbal messages on your screen, and leave the monitor speaker turned on during data transmission.

Note that Register Commands and General Commands may be mixed in any order between the AT characters and the D character that follows. The letter D always marks the start of the telephone number. The modem uses tone dialling to dial 9 - the number often used by private telephone exchange systems like PBX's to access the public telephone system (get the outside dial tone).

The modem switches to Pulse dialling for the national VIATEL service.

.....  
*NOTE: Two consecutive commas in a command string cause the modem to wait four seconds (two per comma) for an outside telephone connection.*  
 .....



# **Synchronous Operation & Manual Control**

# ***Synchronous Operation & Manual Control***

# Chapter 5

## SYNCHRONOUS OPERATION & MANUAL CONTROL

The "SA" models of the SmartModem family are all supplied with switches on the front panel. These switches enable you to control the SmartModem the "old" (conventional) way in both synchronous and asynchronous modes.

All models except 2123A support full "AT" smart operation as well, for mixed synchronous and asynchronous operation.

The following sections describe the various controls for synchronous operation and how to operate the modem manually.

.....  
*NOTE: SmartModem "SA" models are preferred for synchronous applications*  
.....

-----  
**WARNING:** This chapter is really only for expert use in connecting to Synchronous hosts or terminals.  
-----

### Front Panel Switches

---

On the front of the SmartModem "SA" models there are 3 to 5 toggle switches. These switches support manual control over the modem.

-----  
**WARNING:** The settings of the front panel switches are only operational when the rear DIP switch 6 is Down (Dumb Mode), otherwise these switches are ignored.  
-----

The switches are:

#### 2123 & 22 SWITCH (123, 1234 only):

UP	CCITT V.21/V.23	300 or 1200/75 bps Full Duplex or 1200 Half Duplex
DOWN	CCITT V.22/ V.22 bis	1200 or 2400 bps Full Duplex

The '22' switch is called '22+' on the 1234SA models. It will be referred to as the '22(+)' switch.

#### LO & HI SWITCH (Not on 1200):

If 2123/22(+) switch is UP (2123) then LO/HI switch functions as follows:

UP	300 Full Duplex (V.21) Operation.
----	-----------------------------------

DOWN

1200/75 Full Duplex (V.23)  
 1200 Half Duplex (V.23 Mode 2  
 Synchronous)

If 2123/22(+) switch is DOWN (22 or 22+) then LO/HI functions as:

UP

1200 Full Duplex (V.22)

DOWN

2400 Full Duplex (V.22bis)

.....  
*NOTE: 2400 bps is not available on the SmartModem 123SA version.*  
 .....

### ANS & ORIG SWITCH:

UP

Answer:

Connect with remote modem which  
 is in Originate mode (Normally  
 used when answering a call.)

DOWN

Originate:

Connect with remote modem which  
 is in Answer mode (Normally used  
 when originating [dialling] a call.)

### ASYNCR & SYNC SWITCH:

UP

Asynchronous

Modem will only connect on-line  
 to asynchronous hosts or terminals.

DOWN

Synchronous

Modem will only connect on-line  
 to synchronous hosts or terminals.

### TALK & DATA SWITCH:

UP

Talk

Modem will not go on-line until  
 switched to DATA. Used when  
 manually dialling host or manually  
 answering a call.

DOWN

Data

When rear DIP switch 5 is also  
 down (Manual Connect), the  
 modem goes on line. This is used  
 for manually connecting calls.

When rear DIP switch 5 is up  
 (Auto Answer) the modem will  
 automatically answer calls.

.....  
*NOTE: The front panel switch settings are read ONLY when the SmartModem  
 is in "dumb" mode, ie: switch 6 on the rear Dip switch must be down. In  
 "Dumb Mode" the switches, front and rear, override any software controlled  
 parameters.*  
 .....

## Synchronous Speed Range

---

There are three speeds supported by the SmartModem Family for synchronous operation. These are:

CCITT V.23 Mode 2	1200 Half Duplex only (2123SA, 123 and 1234)
CCITT V.22	1200 Full Duplex (1200, 2400, 123 and 1234)
CCITT V.22 bis	2400 Full Duplex (2400 and 1234)

These speeds are selectable through the front panel switches on "SA" models, see the section Front Panel Switches above.

They are selectable through the "B" command on "A" models. See Chapter 4.

## Half Duplex Synchronous Operation

The term "half duplex", in this manual, refers to non-simultaneous bi-directional or "two way alternate" communication.

### - V23 Mode 2 -

The SmartModem operates synchronously at 1200 half duplex in V23 Mode 2.

### - V22, V22bis, HALF DUPLEX -

The SmartModem can simulate half duplex operation at these speeds. It does not switch the transmit carrier on and off, therefore in this mode, there is no line turnaround time, ie: there is instantaneous turnaround. There is no Request-to-Send (RTS) to Clear-to-Send (CTS) delay.

*NOTE: The term "half duplex" is sometimes used (in the context of asynchronous communications) to refer to a condition where characters, transmitted from a data terminal, are echoed back to the terminal by the host computer. Avoid the use of this term; use "echoplex" instead.*

## Clocking Source:

The SmartModems provide synchronous clocks. The transmit and receive clock signals are output to your PC/terminal on two of the pins of the RS232 connection.

Transmit clocks are output on pin 15, while the receive clock is derived from the receive carrier and output on pin 17.

See &X command for transmit clock source.

## Quiet Mode:

In asynchronous mode the SmartModem outputs messages such as "CONNECT" or "NO CARRIER" and echoes the commands which you type in. When operating synchronously these messages and echoing may not be required.

.....  
*NOTE: It is strongly recommended that you select QUIET mode before you set the SmartModem into synchronous mode and save this mode in the SmartModem's non-volatile RAM memory.*  
 .....

To turn off echo and set the SmartModem into quiet mode the following steps should be taken. From an asynchronous terminal connected to the modem, type in:

- i)        AT&F<CR>        This resets the SmartModem to its factory default settings. Use this only if you want the factory default settings restored.
- ii)       ATE0Q1<CR>       Sets the SmartModem into Quiet and No Echo mode.
- iii)      AT&W<CR>        Stores the new settings away in the SmartModem's non-volatile RAM. When the SmartModem is powered on in the future it will operate using these settings until new parameters are stored in the non-volatile RAM.

These commands may be entered as "AT&FEOQ1&W<CR>".

.....  
*NOTE: <CR> means the command must be followed by a Carriage Return/Enter key.*  
 .....

## **Synchronous/Asynchronous Command - "&M"**

In dumb mode SmartModem "A" models will use the preset &M command for determining Asynchronous or Synchronous operation while on line. The "SA" models in dumb mode will use the front switch.

In smart mode this command is used to select between Synchronous and Asynchronous mode when the modem goes on line.

Format:

- &M0 or &M       Operate in Asynchronous mode.
- &M1               Operate in Asynchronous mode while off-line (for command recognition) and in Synchronous mode while on-line. This allows the asynchronous command "AT&M1Dnnnnnn<CR>" to subsequently cause on-line operation in synchronous mode.

When the &M0 (or &M) command has been issued the SmartModem operates in the asynchronous mode. ie: the modem responds to the "AT" commands as specified in Chapter 4. Automatic dialling and answering are standard features in this mode.

The "&M1" form of this command sets the SmartModem to operate synchronously when it goes on-line. However, until the modem goes on-line it will respond to all of the "AT" commands. This feature therefore allows the SmartModem to autodial the host asynchronously but to operate synchronously when connected to the remote station.

Many remote stations may not be expecting messages generated by the modem, so it is suggested that the SmartModem is set to quiet, no echo mode. Send the command "ATE0Q1<CR>" before dialling; this stops PC/terminals/remote stations becoming confused by messages such as "CONNECT".

.....  
***NOTE:** Your PC or terminal must be capable of switching from Asynchronous to Synchronous operation on completion of the "ATD" command.*  
.....

## Manual Operation

Control of the SmartModem manually relies on both the front panel and rear DIP switches. From an operational viewpoint the only difference between synchronous and asynchronous modes, when setting up the modem, is the setting of the ASYNC/SYNC front panel switches.

*NOTE: Remember that manual operation is only available when the SmartModem is in "dumb" mode. Rear DIP switch 6 must be down.*

### USING THE FRONT PANEL SWITCHES TO DIAL:

Table 5-1 describes the correct switch settings to manually dial using the SmartModem, taking advantage of the differing speeds and standards.

DIP switch 5 must be down (Auto Answer disabled - Manual Dial) and DIP switch 6 must be down (Dumb - use Front Switches).

When the front panel switches have been selected pick up the telephone handset and dial the remote station. The remote modem should answer. Raise DTR on your terminal if not already active. At this stage put the modem on-line by moving the Talk/Data switch to DATA. Hang up the telephone handset immediately to avoid data corruption from noise in the local environment.

Speed Required	2123 22+	LO HI	ANS ORIG	ASY SYNC	TALK DATA
300					
V21 ASYNC	UP	UP	DOWN <sup>1</sup>	UP	UP <sup>2</sup>
1200/75					
V23 ASYNC	UP	DOWN	DOWN <sup>1</sup>	UP	UP <sup>2</sup>
1200/HDX					
V23 SYNC	UP	DOWN	*	DOWN	UP <sup>2</sup>
1200/1200					
V22 ASYNC	DOWN	UP	DOWN <sup>1</sup>	UP	UP <sup>2</sup>
1200/1200					
V22 SYNC	DOWN	UP	DOWN <sup>1</sup>	DOWN	UP <sup>2</sup>
2400/2400					
V22bis ASYNC	DOWN	DOWN	DOWN <sup>1</sup>	UP	UP <sup>2</sup>
2400/2400					
V22bis SYNC	DOWN	DOWN	DOWN <sup>1</sup>	DOWN	UP <sup>2</sup>

\* = Ignored.

1 = Normally, however, when originating (dialling) a call, if the remote modem is in "originate" mode then this switch needs to be UP.

2 = UP during manual dial, then DOWN when answer tone heard.

Table 5-1. Manual Dialing Using Front Panel Switches



## MANUALLY ANSWERING A CALL USING THE FRONT PANEL SWITCHES

Security is a prime reason to manually answer an incoming call, ie: verbally establishing the identity of your caller before allowing access to your computer.

.....  
*NOTE: Don't forget to put DIP switch 5 down and switch 6 down when operating in this mode.*  
 .....

The front panel switches can be configured to allow for manual answering and connection. Table 5-2 shows how the switches should be configured.

Having set up the front panel switches, when the phone rings pick up the handset and establish the caller's identity if required. Raise DTR on your terminal. Put the modem on line by switching the Talk/Data switch to DATA. Hang up the telephone handset immediately after switching to DATA. (This avoids corruption of the data from noise in the surrounding environment.)

Speed	21/23 22(+)	LO/ HI	ANS/ ORIG	ASYNC/ SYNC	TALK/ DATA
V21 Async	UP	UP	UP <sup>1</sup>	UP	UP <sup>2</sup>
V23 Async (Viatel Only = Asymmetric Full Duplex, ie 1200/75)	UP	DOWN	UP <sup>1</sup>	UP	UP <sup>2</sup>
V23 Sync	UP	DOWN	UP <sup>1</sup>	DOWN	UP <sup>2</sup>
V22 Async	DOWN	UP	UP <sup>1</sup>	UP	UP <sup>2</sup>
V22 Sync	DOWN	UP	UP <sup>1</sup>	DOWN	UP <sup>2</sup>
V22bis Async	DOWN	DOWN	UP <sup>1</sup>	UP	UP <sup>2</sup>
V22bis Sync	DOWN	DOWN	UP <sup>1</sup>	DOWN	UP <sup>2</sup>

- 1 = Normally, however, when answering a call, if the remote modem is in answer mode this switch needs to be DOWN  
 2 = UP until call received, then DOWN when answer tone is heard.

*Table 5-2. Manual Answering Using The Front Panel Switches*

### AUTOMATIC ANSWER IN DUMB MODE:

DIP switch 5 on the rear panel of the SmartModem indicates whether the modem is to automatically answer an incoming call, when the SmartModem is in dumb mode. When Switch 5 is UP, this indicates the SmartModem will automatically answer an incoming call. Table 5.3 shows how the front panel switches should be set.

For the SmartModem to automatically answer in dumb mode check that:

- The front panel switches are set as required (see Table 5-3);
- DIP switch 5 is up (automatic answer enabled);
- DIP switch 6 is down (dumb mode set on);
- The Talk/Data switch is set to DATA;
- DTR is raised for the incoming call to be connected.

The setting of DIP switch 5 is only checked when DIP switch 6 is DOWN, ie: when the SmartModem is in dumb mode. The position of the front panel switches is checked when the connection is established.

**Note:** *DUMB MODE Means Switch 6 DOWN and Switch 5 UP*

Speed	21/23 22(+)	LO/ HI	ANS/ ORIG	ASYNCR/ SYNC	TALK/ DATA
V21 Async	UP	UP	UP	UP	DOWN
V23 Async (Viatel Only = Asymmetric Full Duplex, ie 1200/75)	UP	DOWN	UP	UP	DOWN
V23 Sync	UP	DOWN	UP	DOWN	DOWN
V22 Async	DOWN	UP	UP	UP	DOWN
V22 Sync	DOWN	UP	UP	DOWN	DOWN
V22bis Async	DOWN	DOWN	UP	UP	DOWN
V22bis Sync	DOWN	DOWN	UP	DOWN	DOWN

*Table 5-3. Automatic Answering Using The Front Panel Switches*

### DISCONNECTING FROM YOUR CALL:

When you have completed your on-line session your phone line will be automatically hung up when you set the Talk/Data switch to TALK, on loss of the remote Carrier signal or on DTR dropping from your PC/terminal

When DIP Switch 5 is DOWN and if the SmartModem is left in DATA mode and DTR (from your PC/terminal) remains high then the modem will stay on-line when carrier is lost. Dropping DTR or moving the Talk/Data switch to TALK will hang up the line. If Switch 5 is UP (Auto Answer on) then the modem will Auto Disconnect.

**NOTE:** *You can tell if DTR is high when the TR light on the SmartModem is on. DTR is low if the TR light is off.*

## **Automatic Synchronous Mode For Answering An Incoming Call**

The SmartModems are capable of operating synchronously without the operation of the front panel switches. Dialling must still be carried out using the telephone handset.

The appropriate parameters must have been previously set up using an asynchronous terminal or PC. When the configuring is complete the parameters must then be saved in the modem's non-volatile RAM. The SmartModem can then be connected to a synchronous terminal for future use.

.....  
*NOTE: DIP switch 6 must be set UP for the SmartModem to operate in Automatic synchronous mode. If DIP switch 6 is down then the SmartModem will look at the settings of the front panel on "SA" models switches to determine its mode of operation.*  
.....

.....  
*NOTE: Make sure that the telephone handset is on-hook (hung-up) while the SmartModem is on line.*  
.....

The steps below detail how to configure the SmartModem for automatic synchronous mode:

- i) Select the appropriate mode using the "B" command, eg: "B5" selects CCITT V.23 Mode 2, see Chapter 4.
- ii) Set the SmartModem into quiet mode, ie: 'Q1', see Chapter 4.
- iii) Turn off command echo, ie: "E0", see Chapter 4.
- iv) Issue the synchronous mode command, ie: "&M1", see earlier in this chapter.
- v) Save these configuration changes to non-volatile RAM, ie: "&W", see Chapter 4.

These commands may be incorporated into one command string, ie: "ATB5Q1E0&M1&W<CR>", should set up your SmartModem to operate at 1200 bps half-duplex synchronous.

Now, when this SmartModem is connected to a synchronous terminal or computer and DTR is raised by the terminal or computer the modem will be ready to automatically answer.

### **Disconnection and Hang up of a Call**

In Automatic Synchronous mode a call is disconnected and hung up automatically when carrier is lost or DTR is lowered.

### **RTS/CTS Signals in Synchronous Mode:**

---

The SmartModem raises the RS232 signal Clear to Send (CTS) when a successful connection is established with the remote modem and the RS232 signal Request to Send (RTS) is raised, ie: if RTS is raised before the connection is established then CTS will be raised by the SmartModem once a successful connection is made.

### **Register S18. RTS (Request to Send) Loss Time Register**

---

This register controls the time that RTS may be low before carrier is lost and the call is terminated.

When operating synchronously, at CCITT V.23 1200 Half Duplex, register S18 waits for up to the number of seconds specified, between two blocks of data, before terminating the connection. The default value for register S18 (in seconds) is 60. S18 may take values from 0-255.

If the time between two blocks being transmitted is greater than the value of S18, then S18 must be adjusted to be greater than this "interblock" time. This is applicable if the modem is at the remote or host end of the system.

### **Leased Line Operation**

---

The suggested method of connection of a SmartModem to a leased line is as described below:

- i) Configure the front panel switches as appropriate for your connection.
- i) Set DIP switch 5 & 6 down, ie: put the SmartModem into 'Dumb' mode.
- iii) Put the Voice/Data switch to DATA. Make sure that the telephone handset is in the hung-up position.
- v) Raise DTR on the PC/terminal, to put the SmartModem on-line.

While DTR is raised the SmartModem will attempt to stay on-line. While the above conditions are in force the SmartModem will remain connected to the line and will attempt to re-establish the communications link if it should be temporarily disconnected.

# ***Diagnostic & Testing Facilities***

# ***Diagnostic & Testing Facilities***

# Chapter 6

## DIAGNOSTIC AND TEST FACILITIES

-----  
**IMPORTANT:** Some of these facilities are only available in V22, V22bis mode. See Chapter 4.  
-----

Failures in data communications links, usually accompanied by unacceptably high error rates or inability to communicate, may be the fault of either the local or remote terminal equipment, the local or remote modem, or the Telecom link. The SmartModem diagnostic and test facilities enable you to determine the source of the failure.

All of the diagnostic tests must be initiated from the asynchronous command state. To use the Remote loopback test, a dialup or leased line connection must first be established. To return to the command state once the connection is established you will need to issue the escape sequence (see Chapter 4).

The following tests are provided:

1. Local Analog Loopback - tests the path which includes the local modem and local data terminal equipment.
2. Remote Digital Loopback - tests the path which includes the local data terminal equipment, local modem, remote modem and telephone circuit.

-----  
*NOTE: The Remote Digital Loopback conforms to a special CCITT standard handshake sequence. CCITT standard V.54 contains the specification.*  
-----

### &T0 COMMAND: TERMINATING A TEST IN PROGRESS

A test may be terminated at any time by issuing the "&T0" command to the SmartModem. If the Local Analog Loopback or Remote Digital Loopback tests are being performed, you must issue the escape sequence to return to local command state before sending the "&T0" command. Commands which follow "&T0" in a command line are ignored.

### &T1 LOCAL ANALOG LOOPBACK L3

This test is used to verify the integrity of the path which includes the local modem and the local terminal equipment.

-----  
*NOTE: If the SmartModem is on-line, this test causes the modem to lose carrier.*  
-----

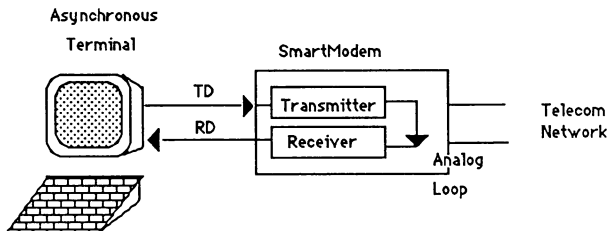


Figure 6-1. Local Analog Loopback.

Example:

Terminal:	AT&T1<CR>	Start Test
	All good men come	User keys in test
	to the aid of	message.
	NetComm.	
	+++	Escape sequence.
Modem:	OK	
Terminal:	AT&T0<CR>	End test.
Modem:	OK	

If the local SmartModem echoes the test message back to the local data terminal exactly as it was transmitted, then the local modem functions correctly.

### &T6 REMOTE DIGITAL LOOPBACK L2

Valid only in V.22, V.22bis, Bell 212A and Bell 2400 modes only.

This test is used to check the local Data Terminal Equipment, the local and remote modem, and the Telecom link. The local terminal sends a test message to the remote station. The remote modem when properly conditioned will loop its receive data back to the local data station. The local data terminal can then compare the incoming data with its transmitted message to check the connection. If the data which is received does not match that transmitted, then either the local terminal, the local or remote modem, or the Telecom link is at fault. If this is the case, both local and remote stations may initiate Local Analog Loopback tests to further isolate the source of the problem.

The terminal operator initiates the remote digital loopback test by:

- \* establishing a connection;
- \* returning to the local command mode by issuing the escape sequence.
- \* issuing the "&T6" command once in the local command mode.



The local modem requests a Digital Loopback with the remote modem through a special CCITT standard handshake sequence (see CCITT Recommendation V.54 for details). The remote modem automatically acknowledges the request if it has been conditioned to do so. The remote modem then loops the output of the modem receiver into the input of the modem transmitter to test the remote modem circuits.

The SmartModem may be conditioned to accept a request from a remote modem for a Remote Digital Loopback with the "&T4" command (default). The SmartModem can be programmed to refuse such a request by issuing the "&T5" command.

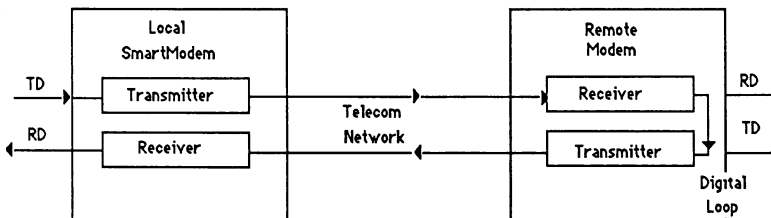


Figure 6-2 Remote Digital Loopback.

Example:

After connection is established . . . .

Terminal:	+++	Escape sequence.
Modem:	OK	
Terminal:	AT&T6<CR>	Start Test.
	More good men come	User keys in test
	to the aid of	message.
	NetComm.	
	+++	Escape sequence.
Modem:	OK	
Terminal:	AT&T0<CR>	End test.
Modem:	OK	

If the local SmartModem echoes the test message back to the local terminal exactly as it was transmitted, then the local terminal equipment, the local and remote modems and the telephone circuit function correctly.

**&T4 GRANT RDL REQUEST FROM REMOTE STATION**

Commands the local SmartModem to grant or accept a request from the remote modem for a Remote Digital Loopback (RDL) test (default).

**&T5 DENY RDL REQUEST FROM REMOTE STATION**

Commands the local SmartModem to ignore (deny) a request from the remote modem for a Remote Digital Loopback test.

# Appendices

# Appendices

# ***APPENDICES***

<i>Appendix A</i>	<i>Data Communications for Beginners</i>
<i>Appendix B</i>	<i>Technical Specifications V.21, V.22, V.22 bis, V.23</i>
<i>Appendix C</i>	<i>Cable Specification</i>
<i>Appendix D</i>	<i>Troubleshooting Tips</i>
<i>Appendix E</i>	<i>Glossary</i>
<i>Appendix F</i>	<i>NetComm Notes</i>
<i>Appendix G</i>	<i>Command Summary</i>
<i>Appendix H</i>	<i>Default Settings</i>
<i>Appendix J</i>	<i>Autoranging Considerations</i>

# APPENDIX A

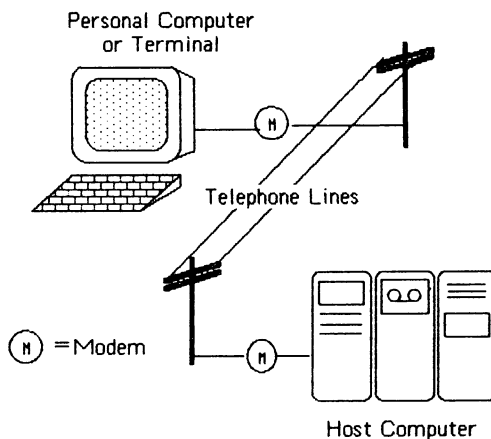
## Data Communications For Beginners

---

Here is a brief summary of key data communications concepts that you should understand.

### EQUIPMENT

Data Communications is the exchange of information between two or more locations. Typically, one of the locations is a computer and the other locations are computer terminals. In the case of a PC, both locations - the PC and the host - are computers.



*Figure A-1. Connection to a Host.*

(From here on we'll call it the "terminal", whether it's a PC or a non-intelligent terminal.

There are two ways to connect computers for communication:

1. "Hard Wire" (sometimes called Direct Connect) -- where the computer and the terminal are in relatively close proximity (within 15 metres). With a hard wire connection the computers are connected by a cable.
2. Remote, telephone or modem connection -- where the computers are connected via a telephone line. A modem is needed for this type of connection so that the digital data can be transmitted over the telephone lines.

When connection is via a modem,

- The modem converts the digital data that comes to it from the computer into analog (sound) signals that can travel over the telephone line, and converts the analog signals that come to it from the telephone lines into digital data that can be received by the computer.
- Telephone lines carry the data, in the form of analog (sound) signals, from one modem to another. The telephone lines may be standard (switched), leased, or privately owned. Telephone lines may also interconnect to "digital packet" data networks such as AUSTPAC and MIDAS.

## PROTOCOLS

There are several sets of rules for how to communicate with the host. Each set of rules is called a protocol. The protocol determines how data is sent across the communications line between two locations. The PC is able to communicate with the host by emulating (imitating) the protocol used by terminals normally connected to the host.

The signal coming from the PC then looks like the signal from any other terminal.

Asynchronous protocols generally transmit the data as it is entered from the keyboard. "Bits" are wrapped around the data to tell the modem to start (prepare) for the character to come, and to stop (and wait) for the next.

Some protocols communicate interactively, others transfer files. When you use an interactive protocol, each character is transmitted as you type it or when you press RETURN or ENTER.

When you use file transfer protocols, you must prepare the data in advance and save it in files on disk, then transmit them a batch to the host.

You can use file transfer protocols to send one or a series of files from one personal computer to another. The data in each file must still be prepared in advance by your word processor, spreadsheet or database program.

With synchronous protocols, the equipment at both ends of the communications line must synchronize with each other before data can be transmitted or received. This makes it possible for the equipment at the receiving end to distinguish individual data bits in the continuous stream of data sent by the equipment at the other end.

## SERIAL AND PARALLEL

Peripheral devices can receive data sent in two ways:

1. Serial data has the bits that represent each character, following one after another.
2. Parallel data is sent with all the bits for one character going in parallel down different pins on the connector.

Nearly all data communication uses serial transfer; this is always so where you use modems to connect over the telephone network.

Some computers come with serial ports built-in and some do not. You must determine if your computer has such a serial port; check if there is a serial connector on the back of your machine.

If you cannot find this connector on your PC, it is likely that you will have to buy one separately. For example, the IBM PC and the APPLE may not come with an RS-232 port. You may need to buy add-on cards that provide this facility.

Nearly every terminal or 'glass teletype' has a DB25/RS232 connector plus a number of switches to select various options for the RS232 serial output.

### DTE & DCE

Also, there are two types of RS-232 connections. One type, called the Data Communications Equipment (DCE) and the other is called Data Terminal Equipment (DTE) It will be necessary for you to know which type is fitted to your computer so that you can purchase or construct the proper type of cable. The cable will be used to connect your machine to your modem.

-----  
**WARNING:** PCs often use a female DB25 connector as their parallel printer connection point. Never connect your modem to the parallel printer port of a PC as you run the risk of damaging your equipment.  
-----



# APPENDIX B

## Technical Specifications

---

<u>Characteristic</u>	<u>Description</u>
Data Format	Serial, binary, synchronous, asynchronous; odd, even or no parity.  One start bit, 7 data bits, odd, even, mark, space or no parity, one or two stop bit (two if no parity).  One start bit, 8 data bits, no parity bit, one stop bit.
Data Speed	300 bits per second. 1200/75 bits per second. 1200 bits per second. 2400 bits per second.
Operating Modes	The operating modes are as follows:  Manual originate. Automatic originate.  Manual answer. Automatic answer.  Manual dial. Automatic dial.
Dialling	Touch-tone (DTMF) or rotary/pulse (DECADIC) dialling.
Communication Mode	Full & half duplex on two-wire switched telephone channels.
Visual Monitor	8 (eight) lights (LED = Light Emitting Diodes) that display:  TD = Transmit Data RD = Receive Data CD = Carrier Detect (DCD on) HS = High Speed AA = Auto Answer RI = Ring Indicate on 2123 models. TR = Terminal Ready (DTR on) 22 = CCITT V.22 (22+ = CCITT V.22 bis - 2400 & 1234 models) (MR = Modem Ready on 2123 models)
Audio Monitor	in-built speaker with volume control.
Intelligence	Microprocessor with integrated ROM & RAM.

Modulation & Compatibility	CCITT V21 (FSK) ** Bell 103 (FSK) CCITT V22 Mode A (i, ii) and Mode B (i, ii, iii, iv) (DPSK) CCITT V23 Mode 1 & 2 (FSK) ** CCITT V22 bis * (QAM) Bell 2400 * (QAM)  (* 2400 and 1234 models only, ** 123, 1234, 2123 models only)  Asynchronous signalling rates at 1200 & 2400 are +1% and -2.5%.  ..... <i>NOTE:</i> <i>FSK = Frequency Shift Keying</i> <i>DPSK = Differential Phase Shift Keying</i> <i>QAM = Quadrature Amplitude Modulation</i> .....
Receiver Dynamic Range	0 to -45 dB full-duplex.
Transmitter Level	-10 dB.
Line Synchronisation	Automatic Adaptive Equalisation (receiver), Fixed Compromise Equalisation (transmitter) [Fixed shared compromise, 21/23 only]
Self-test and Loopbacks	Modem performs Local Analog & Digital Loopback test or Remote Digital Loopback test on command.
Telephone Line Interface	Two-wire 600-ohm, balanced telephone interface meeting Telecom specifications. One Telecom 605 type plug.
Front Panel Switches ("SA" models only)	Talk/Data Async/Sync Ans/Orig Lo/Hi * 2123/22+ ** (* not on 1200SA, ** not on 2123 models)
DIP Switches	1 DCD Override 2 RTS/CTS Loop 3 DTR Override 4 DTR/DSR Loop 5 Auto Answer 6 Dumb Mode 7&8 Unallocated

## Serial Data Interface

25 pin RS232 interface with female DB-25 connector on modem rear panel, wired as a DCE.

PIN FUNCTIONABBREV.

1	Frame Ground	FG
2	Transmit Data	TXD
3	Receive Data	RXD
4	Ready to Send	RTS
5	Clear to Send	CTS
6	Data Set Ready	DSR
7	Ground	GND
8	Data Carrier Detect	DCD
11	Answer/Originate *	AO
12	High Speed	HS
15	Transmitter Clock	TC
17	Receiver Clock	RC
18	Analog Loopback *	AL
20	Data Terminal Ready	DTR
21	Remote Digital Loopback *	RDL
22	Ring Indicator	RI
23	Data Rate *	DR
24	External Clock	XCLK
25	Test *	TST
(* not currently used)		

## Power Supply

Floor, desk or wall mounted plug pack. 240 V AC, 50 Hz transformer to 9 V AC, 1 amp.

## Physical Dimensions

200 X 160 X 32 mm.

## Environmental

The modem meets specification requirements, when operated under the following conditions:

## Operating -

Ambient temperature: 0 to 40 deg. Celsius.  
Relative humidity: 80% max. with no condensation.

## Storage -

Ambient temperature: -20 to +65 deg. Cel.  
Relative humidity: 95% max. with no condensation.

Telecom Approval  
Certification and  
Compliance

Authorisation Number C85/37/1310 (Telecom Australia).



# APPENDIX C

## The Cable Specification

This diagram shows you the cable to connect the SmartModem to your PC's or terminal's serial RS232 port. It is a "straight through" cable and does not contain a crossover.

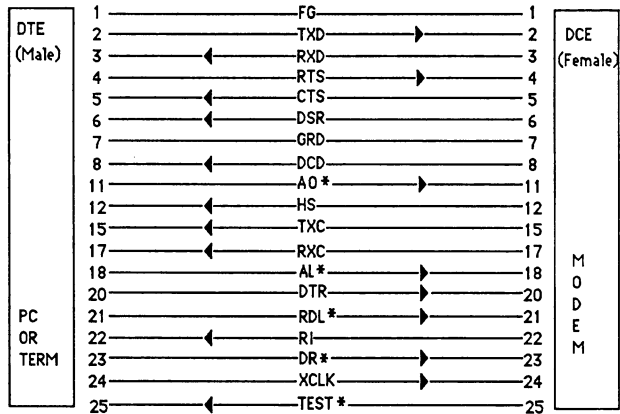


Figure C-1. The Cable Connection.

Notice that the convention of DTE & DCE indicates you should have a male to female cable, though this may vary from PC to PC and terminal to terminal. You certainly must use a male-ended cable to plug into the modem.

(\* Not currently used)



# APPENDIX D

## Troubleshooting Tips

Most of the problems with your modem will occur during installation. Check this carefully.

.....  
**IMPORTANT:** This is not a repair procedure. Modems requiring adjustments not covered below should be returned to your dealer for service.  
 .....

.....  
**WARNING:** Do not remove the modem case. The modem has no parts within the case that you can service. Removing the case may void your warranty.  
 .....

Sending and receiving data requires more than a modem. Your PC is part of a system that includes a telephone line and another computer system. You can solve some operating problems by checking your programs and adjusting your modem - you cannot solve problems caused by the telephone line or the other computer system.

## THE QUICK FIX LIST

You can solve most problems by checking the following things:

Recheck each cable, even though you may be sure that they are plugged in properly. Do not try to clean jacks or connectors

1. Check to see that all cables connected to the modem are securely connected at both ends.
  - \* RS232 cable - connected to the modem and to the correct serial port on your PC or terminal?
  - \* Modem Power cable - connected to the modem and the plug pack plugged into the wall power outlet? Is the wall plug switched on?
  - \* Telephone cable (the one that came with the modem) - connected to the modem and the telephone wall socket?
2. Check to see that the PC program and the remote computer system have each selected the same speed (bps or baud), data bit selection (either 7 or 8 bits) and parity.

3. Make sure that the DIP switch settings on the back of the modem are set properly. In a normal installation the switches are as follows:
  - Switch 1 - UP
  - Switch 2 - UP
  - Switch 3 - UP
  - Switch 4 - UP
  - Switch 5 - UP
  - Switch 6 - UP
  - Switch 7 - UP
  - Switch 8 - UP
4. Check the following:
  - Does the modem turn on?
  - Does it accept any commands? Does it respond to the "A/" command (See "Testing your Installation" in Chapter 2)?
  - Does it display messages?
  - Does it send or receive data?
  - Does the problem repeat, or does it seem to come and go irregularly?
  - Can the modem continue to process commands?
  - What happens to the command, message or data that fail to work correctly?
  - What is the last correct action just before something goes wrong?
  - What is the last screen message displayed?

Check over what you've learned about the problem. Do you have a modem problem - or is it really a problem with something else? You will solve most problems by checking all the cables, and by checking the PC program.



**DETAILED CHECK LIST**

---

Any of these things could be causing the problem; the telecommunications line, the hardware, the session details setup, the quality of the phone line.

**TELECOMMUNICATIONS LINE CHECKLIST**

If you're using a direct outside switched (dial-up) telephone line, check these things to find out if the problem is in the telecommunications line (that is, at the host, host modem or on the telephone line):

- Is the host down? Is the host modem working? Is the port on the host available? The usual indication of a problem is a ringing phone with no answer.
- Is the modem set up for Bell or CCITT standards? In Australia it should be CCITT. Have you set up the modem compatible with the host modem? Ask the systems programmer or on-site support person.
- Are you calling the correct phone number for the host? (Call the number and listen for the characteristic tone signal. If a person answers, maybe you've got the wrong number!)
- After you've installed your modem, can you still make a voice phone call from your attached handset (if any)?
- If you're using automatic dialling, check to make sure that it's the correct number. Check that a dial tone is present first.

.....  
**WARNING: Some PABX's and most Telecom Commander systems can cause serious operational problems. Call Telecom and ask them to provide a direct switched line or a modem piggyback socket.**  
.....

**HARDWARE CHECKLIST**

Run the loopback test to check that the SmartModem is functioning correctly.

- \* Load up your PC communications program and enter terminal mode (without dialling and connecting to a host).
- \* Type AT&T1<CR> ie: Analog Loopback mode.
- \* You should have the message CONNECT displayed. If the CONNECT message is not displayed then the SmartModem is not functioning correctly. Check that the installation procedure has been followed and the serial port is configured correctly.

- \* Once the CONNECT message is displayed, type a few lines of characters until you are happy the data you're keying in is being returned (echoed) correctly. You will see the characters displayed on the screen. Your typed data may sometimes appear in duplicate if you have set up your communications program as half-duplex. Don't worry, this is quite normal.
- \* Wait 1 second, type in +++ (ie: 3 plus's) and wait 1 more second, which should return the message "OK".
- \* Then type AT&T0<CR> to terminate the test.

## COMMUNICATION PACKAGE

Check these things to find out if the problem is in the way you set up your communications package:

- Check to make sure that the protocol details specified in the set-up detail are correct for your session.

To find out more about setup details and how to specify them. See the manual for the terminal package or protocol emulator you're using. They must be the same at each end of the comms link, ie: the PC and the host.

- Make sure that your LOGON procedure matches the host's requirements. The most common mistakes are spelling mistakes and wrong entries in LOGON, account and password.

## PHONE LINE QUALITY CHECKLIST

Check these things to find out if the problem is due to a poor quality telephone line:

- If you're using a switched (dial) telephone line, check if the phone line is noisy.

Some phone line problems that effect high speed modems are imperceptible to the human ear. The symptoms of such phone line problems are lots of errors and poor communication with a variety of hosts. If you encounter these problems, hang up and dial again. If these problems persist, then contact Telecom to solve them.

# APPENDIX E

## GLOSSARY

---

analog signal	-	A signal that varies continuously over time.
ASCII code	-	American Standard Code for Information Interchange. A standard way of representing each letter, number, special character and control character as a 7-bit binary number.
binary digit	-	The smallest unit of information in the binary number system. Also called a "bit".
binary synchronous communications-		A type of protocol that synchronises both ends of the communication line, then transmits binary data across the line.
bit	-	See binary digit.
digital data	-	Data that can be represented by binary digits.
EBCDIC code	-	Extended Binary Coded Decimal Interchange Code. A code used by IBM that represents each letter, number, special character, and control character as an 8-bit binary number.
file transfer protocol	-	A protocol that only exchanges disk files with the host. This type of protocol does not allow you to communicate interactively with the host.
interactive protocol	-	A protocol that lets you communicate interactively with the host. In this kind of protocol, part or all of the contents of the screen display are sent to the host when you press RETURN; you do not have to communicate with the host by sending it disk files.
host	-	The computer that is in control in a data communications network. The host may be a mainframe, mini, or micro computer.
modem	-	A device that converts digital signals to analog signals, and vice versa. Modem stands for "modulator-demodulator".
Prestel	-	British Telecom's Videotex/Viewdata service and the name of all services that use the BT protocol. System used by Australian Telecom.
protocol	-	A set of rules for sending and receiving data on a communications line.
RS232 cable	-	Any cable that is wired in accordance with the RS232 (or CCITT V24) standard, which is the world-wide standard data communications interface standard.

## SmartModem Family

## User & Reference Manual

### Teletex

- A videocast (TV transmitted) Videotex system that generally lacks the interactive nature or high volume data base aspects of Videotex.

### Videotex/Viewdata

- On-line interactive colour graphic information retrieval system. Users complete enquiries by entering simple commands and by accepting options displayed on menus. Now frequently linked ("gateways") to other computer data base systems.

# APPENDIX F

## NetComm Notes

---

Note	Subject	Date
1	PABX, SWITCHBOARDS, COMMANDERS ETC	OCT 85

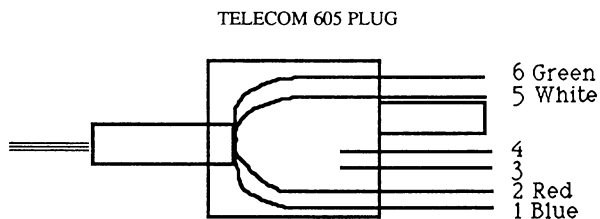
## NETCOMM NOTES

SmartModem (R) 123

### PABX's, Switchboards & Commander Systems

1. Always use a direct outside telephone line if you can. They are much cleaner, ie no operator interrupts, disconnects, etc.
2. If you must go through a PABX or Switchboard then you need to bear these points in mind:
  - a) Don't forget to put the "0" or "9" at the front of the number you're dialling, if required.
  - b) If it takes a while to get an internal line and/or an outside line, don't be afraid to put in a couple of commas to make sure that you get connected, eg: ATD,,9,,1234567<CR>. The commas indicate to the Modem that a pause of approximately two (2) seconds is required.
  - c) Check to see if your PABX or switchboard is tone only. If it is, then you won't be able to pulse dial the "9" or "0" to get your outside line. Get around this by telling the modem to dial the prefix in tone, eg: ATDT,,9,,P1234567<CR>. This dials the outside line prefix in tone and the telephone number in pulse (known as decadic).
3. Connections into PABX's, Switchboards & Commander Systems:

The Telecom 605 plug supplied on the end of the long white cable supplied with each SmartModem is wired for a standard telephone connection and what Telecom calls "Mode 1" (for modems), ie:



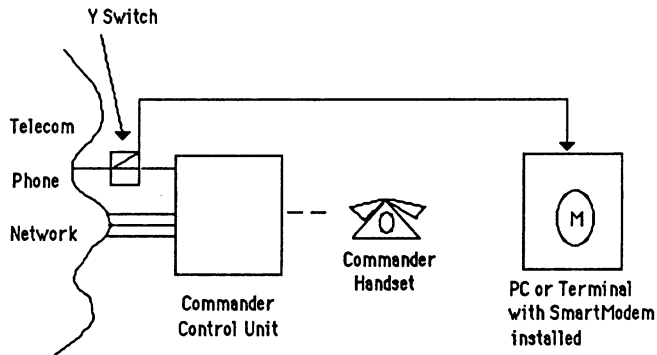
*Figure 1*

Some private PABX & Switchboards wire up the wall sockets differently to Telecom and therefore cause some confusion to systems (such as SmartModem which expect standard Telecom sockets).

To get around some of this confusion there is an option:

### Commander Systems -

The wiring of the sockets for Commander systems is different to standard telephone handsets. One of Telecom's suggestions for including devices such as SmartModem into an organisation with only Commanders is to get them to instal a Y switch, see diagram below:



*Figure 2*

That is, at the flick of a switch, you intercept one of the telephone lines before it gets into the Commander system. For the period you require it, that line is dedicated to you and your communications and not available to the Commander system. Telecom will install this system for a small charge.

The Telecom Australia pamphlet "Data Communications through Telecom Commander Systems" describes the methods by which modems may be used with Commanders.

4. Remember: You can't tone dial on pulse (decadic) only Telecom exchanges, but you can usually pulse dial on tone exchanges.
5. If you like your current telephone handset and still want to use it along with the SmartModem, NetComm has available a range of "Super Snap" connectors that do just that. You can connect your normal phone or one of the NetComm optional handsets. Refer to the pamphlet inside the modem package.





# APPENDIX G

## NetComm SmartModem Family -

### Summary of "AT" Commands

\* = Factory and Default Settings

<u>COMMAND</u>	<u>CODE</u>	<u>PARAMETERS</u>																																																																																																																													
Escape Sequence	+++	Pause 1 second before and after																																																																																																																													
On-Line	Ø	0 = Go back on-line; 1 = Initiate retrain;																																																																																																																													
Reset	Z	Restore from Non-Volatile RAM																																																																																																																													
Echo	E	0 = Off 1 = On*																																																																																																																													
Bell	B	<table><tr><th colspan="3">Originate</th><th colspan="3">Answer Range</th></tr><tr><th></th><th>300</th><th>1200</th><th>2400</th><th>1</th><th>2</th><th>3</th></tr><tr><td>0 =</td><td>V21</td><td>V23</td><td>V22bis</td><td>V23</td><td>V22</td><td>V21*</td></tr><tr><td>1 =</td><td>103</td><td>212</td><td>2400</td><td>V22</td><td>V21</td><td>V23</td></tr><tr><td>2 =</td><td>V21</td><td>V22</td><td>V22bis</td><td>V22</td><td>V21</td><td>V23</td></tr><tr><td>3 =</td><td>V21</td><td>-</td><td>-</td><td>V21</td><td>-</td><td>-</td></tr><tr><td>4 =</td><td>103</td><td>-</td><td>-</td><td>103</td><td>-</td><td>-</td></tr><tr><td>5 =</td><td>-</td><td>V23</td><td>-</td><td>-</td><td>V23</td><td>-</td></tr><tr><td>6 =</td><td>-</td><td>V22</td><td>-</td><td>-</td><td>V22</td><td>-</td></tr><tr><td>7 =</td><td>-</td><td>212</td><td>-</td><td>-</td><td>V22</td><td>-</td></tr><tr><td>8 =</td><td>-</td><td>-</td><td>V22bis</td><td>-</td><td>-</td><td>V22bis</td></tr><tr><td>9 =</td><td>-</td><td>-</td><td>Bell 2400</td><td>-</td><td>-</td><td>Bell 2400</td></tr><tr><td>10 =</td><td>V21</td><td>V23</td><td>V22bis</td><td>V23</td><td>V21</td><td>V22</td></tr><tr><td>11 =</td><td>V21</td><td>V23</td><td>V22bis</td><td>V21</td><td>V23</td><td>V22</td></tr><tr><td>12 =</td><td>V21</td><td>V23</td><td>V22bis</td><td>V23</td><td>V22</td><td>V21</td></tr><tr><td>13 =</td><td>V21</td><td>V22</td><td>V22bis</td><td>V21</td><td>V22</td><td>V23</td></tr><tr><td>14 =</td><td>V21</td><td>V22</td><td>V22bis</td><td>V22</td><td>V23</td><td>V21</td></tr><tr><td>15 =</td><td>V21</td><td>V22</td><td>V22bis</td><td>V22</td><td>V21</td><td>V23</td></tr></table>	Originate			Answer Range				300	1200	2400	1	2	3	0 =	V21	V23	V22bis	V23	V22	V21*	1 =	103	212	2400	V22	V21	V23	2 =	V21	V22	V22bis	V22	V21	V23	3 =	V21	-	-	V21	-	-	4 =	103	-	-	103	-	-	5 =	-	V23	-	-	V23	-	6 =	-	V22	-	-	V22	-	7 =	-	212	-	-	V22	-	8 =	-	-	V22bis	-	-	V22bis	9 =	-	-	Bell 2400	-	-	Bell 2400	10 =	V21	V23	V22bis	V23	V21	V22	11 =	V21	V23	V22bis	V21	V23	V22	12 =	V21	V23	V22bis	V23	V22	V21	13 =	V21	V22	V22bis	V21	V22	V23	14 =	V21	V22	V22bis	V22	V23	V21	15 =	V21	V22	V22bis	V22	V21	V23
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Monitor Speaker	M	0 = Off 1 = On during dial/answer; off on connection* 2 = On always;																																																																																																																													
Response Code	V	0 = Display numeric; 1 = display verbal responses*																																																																																																																													
Quiet	Q	0 = Send responses* 1 = responses off																																																																																																																													
Self Test	&T	0 = Halt test; 1 = Local Analog Loopback 4 = Grant RDL; * 5 = Deny RDL; 6 = Start RDL																																																																																																																													
Dial	D	Followed by 0-9, T P R ;																																																																																																																													
Redial Last Number	A/	Repeats last AT command																																																																																																																													
Set Registers	Sn=	n = 0-27 = Special Registers																																																																																																																													
Answer	A	Answer call																																																																																																																													
Read Registers	Sn?	n = 0-18 = Special Registers (see P.T.O.)																																																																																																																													
Extended Responses	X	0 = Issue basic responses 1 to 4 * 1 = Issue extended responses 1 to 10																																																																																																																													
Synchronous/ Asynchronous	&M	0 = Asynchronous operation * 1 = Synchronous operation																																																																																																																													

Guard Tone	&G	0 = Do not generate * 1 = Generate tones at 550 Hz 2 = Generate tones at 1800 Hz
Long Space Disconnect	Y	0 = Disable long space disconnect* 1 = Enable long space disconnect.
Carrier Detect	&C	0 = Always on; 1 = determined from remote modem*
DTR	&D	0 = Always high; 1 = Determined from remote host. *
Generate Clocks	&X	0 = Modem generates;* 1 = PC/terminal generates; 2 = received from host
Hang Up	H	0 = Hang up 1 = Go off-hook
Read Factory Defaults	&F	No parameters
Write to Non-Volatile RAM	&W	No parameters
Answer Tone Sequence	&A	0 = Full Answer Tone sequence is issued on first range only.* 1 = Full Answer Tone sequence is performed on each range.
Identify	I	No parameters

## RESPONSE CODES

0	OK	Command accepted & executed
1	CONNECT	Carrier detected & connection established
2	RING	Ringing signal detected
3	NO CARRIER	Carrier lost or not detected
4	ERROR	Command > 40 chars; not recognised; Speed of 300 selected for synch operation
5	CONNECT 1200	Carrier detected at 1200/75 or 1200
6-9	--	Not used
10	CONNECT 2400	Carrier detected at 2400

## SPECIAL REGISTERS

REGISTER	RANGE	DEFAULT	
0	0-255	01	Ring to answer on
2	0-127	43	Escape Code character (255 disables)
3	0-127	13	Value for <CR> Carriage Return
4	0-127	10	Value for Line Feed
5	0-127	08	Value for Back space
6	1-30	02	Wait time for dial tone (Sec.)
7	1-60	30	Wait time for carrier (Sec.)
8	0-30	02	Pause Length (Sec.)
9	1-255	12	Carrier Detect Response Time (Tenths Sec.)
10	1-255	14	Carrier Loss Response Time (Tenths Sec.)
11	1-255	08	Auto Ranging Detect Time (Sec)
12	3-255	50	Escape sequence time delay (1/50 sec.)
18	0-255	60	RTS Loss Time (Sec)

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(10/86 V.9xx)

# APPENDIX H

## Default Settings

---

The factory default setting for the SmartModem family modems can be reestablished in the modem with the &F command.

The first modems to use the "AT" command set did not have any non-volatile memory. Their default operation was established by switch settings. When an ATZ command was issued to the modem the default parameters were established from the settings of the command switches.

The present generation of "AT" command set modems, including SmartModems covered by this manual, can be instructed to store the equivalent of switch settings (and many other parameters) in non-volatile memory. An ATZ command establishes operating parameters from the information stored in the SmartModem's non-volatile memory.

The &F command resets the SmartModem's parameters to a known state, i.e. the factory default settings. The &F command by itself will only reset the parameters for the modem until you change parameters individually or issue an ATZ command. To make the modem remember the factory default settings for reestablishing with the ATZ command you should also issue an &W command.

Because the &F command establishes a known set of parameters in the SmartModem it is a good starting point for establishing your own individual set of preferred parameters, which may be stored in the modem with the &W command.

The factory default settings established by the &F command are:

B0	Transmission mode (except 1200 & 2400 which are B2)
E1	Echo commands
M1	Speaker on during dialling
Q0	Send responses
V1	Send verbal responses
X0	Basic response codes
Y0	Disable long space disconnect
&A0	Full answer tone on first range only
&C1	DCD determined from remote modem
&G0	No guard tone
&M0	Asynchronous operation
&T4	Grant RDL
&X0	Modem generates sync clocks
S0=01	Auto answer (on 1st ring)
S2=43	Escape code is "+++"
S3=13	Carriage return
S4=10	Line feed
S5=08	Backspace
S6=02	Wait 2 seconds for dial tone
S7=30	Wait 30 seconds for carrier detect
S8=02	Dial pause for 2 seconds
S9=12	Carrier detect response is 1.2 s
S10=14	Carrier loss response is 1.4 s
S11=08	Auto ranging detect time is 8 s
S12=50	Escape sequence delay is 1 s
S18=60	RTS loss time is 60 s

(other S registers not used)

Other conditions established by &F are:

7 bits plus even parity  
1200 baud initial serial interface speed  
off line  
pulse dialling

# APPENDIX I

## Autoranging Considerations

---

The B command allows selection of a variety of autoranging sequences for auto answer operation.

The time for "attempt to connect" on each range of the auto range sequence is set by the S11 register. The factory default value for S11 is 8 seconds. With three ranges to auto range over this default value gives a total ranging time of 24 seconds (3 x 8 seconds).

To this must be added the answer tone sequence as set by the &A command. the factory default for the answer tone sequence of 5 seconds on the first range only. This yields a total factory default auto ranging sequence of 29 seconds (5 seconds + 24 seconds).

The autoranging defaults have been set this way because the factory defaults for most AT command set modems, when originating a call, will allow 30 seconds to detect carrier after the dial command is issued. An autoranging answering sequence of 29 seconds will generally allow adequate time for the calling modem to listen for the range it requires to connect.

If you alter the value in the S11 register and/or the &A parameter you should ensure that the total value of the range sequence doesn't exceed 30 seconds unless you are prepared to instruct callers to set their modems for a longer wait time for carrier (controlled by S7 on "AT" command set modems).

.....  
*NOTE: The time for carrier detect set by S7 starts immediately after the ATD command is issued, and includes dialling delays etc.*  
.....





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